



Supply Chain Integration and Flexibility as Drivers of Supply Chain Performance: Evidence from Pakistan's Manufacturing Sector

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Abstract: In an increasingly competitive and uncertain business environment, supply chain capabilities play a critical role in enhancing organizational performance, particularly within emerging economies. This study examines the impact of Supply Chain Integration (SCI) and Supply Chain Flexibility (SCF) on Supply Chain Performance (SCP) in Pakistan's manufacturing sector. Grounded in the Resource-Based View (RBV), the study conceptualizes integration and flexibility as strategic organizational capabilities that enable firms to achieve superior performance outcomes. A quantitative research design was employed, and primary data were collected through a structured survey administered to managers working in textile, fast-moving consumer goods (FMCG), and pharmaceutical manufacturing firms across Pakistan. A total of 250 valid responses were analyzed using multiple regression techniques. The empirical findings reveal that both supply chain integration and supply chain flexibility have a positive and statistically significant influence on supply chain performance. Specifically, internal supply chain integration and reactive supply chain flexibility emerged as the most influential dimensions, indicating that cross-functional coordination and the ability to respond rapidly to operational disruptions are critical drivers of performance. The combined regression model explains approximately 39% of the variance in supply chain performance, demonstrating the substantial explanatory power of these supply chain capabilities. The results suggest that Pakistani manufacturing firms can enhance delivery reliability, cost efficiency, and overall operational effectiveness by simultaneously strengthening their integration mechanisms and flexibility practices. From a managerial perspective, the study highlights the importance of investing in information sharing systems, cross-functional collaboration, and adaptive supply chain structures. Theoretically, this research contributes to the supply chain management literature by extending RBV-based empirical evidence from a developing-country context. Future research is encouraged to explore longitudinal designs, incorporate additional moderating or mediating variables, and examine other industrial sectors to further validate and generalize the findings.

Keywords: Supply Chain Integration, Supply Chain Flexibility, Supply Chain Performance, Manufacturing Sector, Pakistan; Resource-Based View.

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1. Introduction

In today's highly dynamic and competitive business environment, the supply chain has emerged as a critical strategic asset for enhancing organizational competitiveness, particularly in emerging economies. Among the various supply chain capabilities, Supply Chain Integration (SCI) and Supply Chain Flexibility (SCF) are widely recognized as key drivers of Supply Chain Performance (SCP). Prior research suggests that effective integration across internal functions and external partners improves coordination, information sharing, and cost efficiency, while flexibility enables firms to respond rapidly to market disruptions and demand uncertainty (Albhirat et al., 2023; Lau et al., 2025; Yimer et al., 2025)

Despite growing scholarly attention, empirical evidence on the combined effects of supply chain integration and flexibility remains limited in developing-country contexts such as Pakistan. Pakistani manufacturing firms face persistent challenges, including inadequate infrastructure, volatile demand conditions, resource constraints, and increasing global competition. These challenges heighten the need for integrated and flexible supply chain systems; however, limited research has examined how these capabilities translate into performance improvements across key manufacturing sectors.

Addressing this gap, the present study investigates the influence of supply chain integration and supply chain flexibility on supply chain performance in Pakistan's textile, fast-moving consumer goods (FMCG), (Bolaji et al., 2024) and pharmaceutical industries. By providing empirical evidence from a developing economy, this research contributes to the supply chain management literature and offers practical insights for managers seeking to enhance operational effectiveness through strategic supply chain capabilities.

1.1 Research Objectives

The specific objectives of this study are to:

1. Examine the impact of supply chain integration on supply chain performance.
2. Assess the impact of supply chain flexibility on supply chain performance.
3. Analyze the combined effect of supply chain integration and flexibility on supply chain performance in Pakistan's manufacturing sector.

2 Literature Review

2.1 Supply Chain Integration

Supply Chain Integration (SCI) refers to the extent to which a firm strategically collaborates with internal functions and external partners to achieve coordinated, seamless, and information-driven supply chain operations. SCI enables organizations to synchronize material flows, information exchange, and decision-making processes across the supply chain network, thereby improving efficiency and responsiveness (Bolaji et al., 2024). The literature commonly categorizes SCI into internal integration coordination among departments such as procurement, production, and logistics and external integration, which involves collaboration with suppliers and customers.

Internal integration enhances cross-functional communication, aligns organizational goals, and reduces operational silos. When departments share real-time information and jointly participate in planning and execution, firms can reduce lead times, minimize inventory costs, and improve service quality (Hafeez et al., n.d.; Rahman et al., 2025). Recent studies further suggest that digital technologies, such as enterprise resource planning (ERP) systems and cloud-based platforms, significantly strengthen internal integration by enabling visibility and data accuracy. In manufacturing environments, (Junejo et al., 2022) internal integration has been shown to play a foundational role, as effective internal coordination often precedes successful external collaboration.

(Hafeez et al., n.d.). Empirical evidence indicates that externally integrated firms experience improved delivery reliability, reduced transaction costs, and enhanced market responsiveness. In emerging economies, however, external integration is often constrained by trust issues, technological gaps, and weak institutional frameworks (Arshad Ali & Mahmood, 2024; Tao et al., 2025). These challenges make it particularly important to understand how integration practices operate within developing-country contexts such as Pakistan. (Arshad Ali & Mahmood, 2024) demonstrated that internal and supplier integration significantly improve operational performance in the textile industry. Similarly, Khan et al. (2024) customer integration strengthens supply chain agility and cost efficiency in FMCG firms. Collectively, these findings suggest that SCI functions as a strategic capability that enhances organizational performance by enabling coordination, transparency, and alignment across supply chain actors.

Based on the reviewed literature, the following hypothesis is proposed:

H1: Supply Chain Integration positively influences Supply Chain Performance.

2.2 Supply Chain Flexibility

Supply Chain Flexibility (SCF) is defined as the capability of a supply chain to adapt efficiently and effectively to changes in demand, supply conditions, and environmental uncertainty (Shafique et al., 2023). In today's volatile business environment, flexibility has become a critical determinant of supply chain resilience and performance. SCF allows firms to reconfigure resources, modify production volumes, and adjust logistics operations in response to disruptions and market fluctuations.

(Siddiqui et al., 2025) Recent studies highlight the increasing importance of SCF in emerging economies, where supply chains are frequently exposed to infrastructural inefficiencies, political instability, and fluctuating demand patterns. (Bhatti et al., 2023) found that reactive flexibility significantly improves delivery reliability and customer satisfaction in manufacturing firms operating under high uncertainty. Similarly, proactive flexibility has been linked to long-term performance gains through improved risk management and strategic adaptability.

Digital tools such as predictive analytics, artificial intelligence, and real-time tracking systems enhance firms' ability to anticipate disruptions and respond rapidly (Fahad et al., n.d.). These technologies are particularly valuable for manufacturing firms seeking to balance efficiency with adaptability. In the context of Pakistan, limited technological adoption remains a challenge; however, firms that invest in flexible supply chain structures demonstrate superior performance outcomes compared to less adaptive competitors (Jing & Fan, 2024)

Empirical research consistently supports the positive relationship between SCF and supply chain performance. (Qadeer et al., n.d.) reported that both reactive and proactive flexibility significantly enhance operational efficiency in Pakistani manufacturing firms. More recent evidence by Ahmed et al. (2024) further confirms that flexibility improves cost performance and service levels in volatile market conditions. These findings suggest that SCF functions as a dynamic capability that enables firms to sustain performance under uncertainty.

Accordingly, the following hypothesis is proposed:

H2: Supply Chain Flexibility positively influences Supply Chain Performance.

2.3 Theoretical Perspective: Resource-Based View

The Resource-Based View (RBV), which posits that firms achieve sustained competitive advantage by acquiring and deploying resources that are valuable, rare, inimitable, and non-substitutable. According to RBV, organizational capabilities rather than physical assets alone are the primary sources of superior performance.

Within this framework, both supply chain integration and supply chain flexibility can be conceptualized as capability-based resources. SCI represents an embedded organizational capability arising from relational ties, information-sharing routines, and coordinated processes that are difficult for competitors to replicate (Qasir & Agha, 2025). Similarly, SCF reflects a firm's dynamic capability to sense, respond to, and adapt to environmental changes, thereby enabling sustained performance advantages (Imtiaz Hussain et al., 2025).

Recent RBV-based studies emphasize the complementary nature of integration and flexibility. (Aljoghaiman & Bhatti, 2022) argue that integration enhances information visibility, while flexibility determines how effectively firms act upon that information. When deployed jointly, these capabilities reinforce each other, leading to improved supply chain performance and resilience. By adopting the RBV as its theoretical lens, this study positions SCI and SCF as strategic resources that explain performance differences among manufacturing firms in Pakistan. The framework supports the proposed hypotheses by suggesting that firms with higher levels of integration and flexibility are better equipped to leverage resources efficiently and respond effectively to environmental challenges.

3. Methodology

3.1 Research Design

This study adopts a quantitative, cross-sectional research design to examine the relationships between supply chain integration, (Muhammad Annan et al., 2024) supply chain flexibility, and supply chain performance in Pakistan's manufacturing sector. A quantitative approach is appropriate given the study's objective to test hypothesized relationships using numerical data and statistical techniques. Cross-sectional survey designs are widely used in supply chain management research due to their effectiveness in capturing organizational practices and managerial perceptions at a specific point in time.

The research is grounded in the positivist research paradigm, which assumes that relationships among variables can be objectively measured and empirically tested. The use of structured questionnaires and (Piprani et al., 2022)statistical modeling enables generalization of findings within the defined population. This approach is consistent with prior empirical studies examining supply chain capabilities and performance in emerging economies.

3.2 Population and Sample Selection

The target population for this study comprises manufacturing firms operating in Pakistan, specifically within the textile, fast-moving consumer goods (FMCG), and pharmaceutical sectors. These industries were selected due to their significant contribution to Pakistan’s industrial output and their reliance on complex supply chain networks(Ali et al., 2024; Aslam et al., 2025). Moreover, these sectors experience varying degrees of demand uncertainty, regulatory pressure, and operational complexity, making them suitable for examining supply chain integration and flexibility.

Data were collected from managerial-level respondents, including supply chain managers, logistics managers, procurement managers, and operations managers. These individuals were chosen because of their direct involvement in supply chain planning, coordination, and performance evaluation, ensuring that responses reflect informed organizational practices rather than operational-level perceptions.

Table 1: *Variable’s Data*

Variable	N	Mean	Std. Deviation
Supply Chain Integration (SCI)	250	3.78	0.62
Supply Chain Flexibility (SCF)	250	3.85	0.58
Supply Chain Performance (SCP)	250	3.90	0.65

A non-probability purposive sampling technique was employed to ensure that respondents possessed adequate knowledge of supply chain operations(Malik et al., 2024; Rashid & Rasheed, 2025). Although probability sampling enhances generalizability, purposive sampling is commonly used in supply chain studies where access to specialized managerial respondents is required.

A total of 250 valid questionnaires were obtained and included in the final analysis. The sector-wise distribution of respondents was as follows:

- Textile industry: 40%
- FMCG industry: 35%
- Pharmaceutical industry: 25%

This distribution reflects the relative dominance of the textile sector in Pakistan while maintaining adequate representation of FMCG and pharmaceutical firms.

3.3 Data Collection Procedure

Primary data were collected using a self-administered structured questionnaire. The questionnaire was distributed electronically via email and professional networking platforms to ensure broad geographic coverage and respondent convenience. Prior to full-scale data collection, the instrument was pre-tested with academic experts and industry practitioners to ensure clarity, relevance, and content validity. Minor wording adjustments were made based on feedback to enhance comprehension. Participation in the survey was voluntary, and respondents were assured of confidentiality and anonymity. No personally identifiable information was collected, minimizing social desirability bias and encouraging honest responses. The data collection process was conducted over a period of approximately eight weeks.

3.4. Measurement Instrument

All study constructs were measured using previously validated scales adapted from established supply chain management literature to ensure reliability and construct validity. Responses were recorded using a five-point Likert scale, where 1 = Strongly Disagree and 5 = Strongly Agree.

3.4.1. Supply Chain Integration (SCI)

Supply chain integration was operationalized as a multidimensional construct comprising internal integration and external integration (Ahmad & Ghafoor Khokhar, 2024). Internal integration measures the degree of coordination and information sharing across functional departments, such as procurement, production, and logistics. External integration captures the extent of collaboration and information exchange with suppliers and customers.

Example item:

“Cross-departmental information is shared in real time within our organization.”

3.4.2. Supply Chain Flexibility (SCF)

Supply chain flexibility was measured using two dimensions: reactive flexibility and proactive flexibility. Reactive flexibility assesses (Zia ul Haq & Aslam, 2022) the firm’s ability to respond quickly to unexpected disruptions, while proactive flexibility evaluates preparedness through planning, alternative sourcing, and capacity adjustments.

Example item:

“Our supply chain adapts quickly to sudden changes in customer demand.”

3.4.3. Supply Chain Performance (SCP)

Supply chain performance was measured using indicators related to cost efficiency, delivery reliability, and quality performance. These dimensions reflect widely accepted operational performance outcomes in supply chain research.

Example item:

“We consistently meet delivery schedules promised to customers.”

3.5. Reliability and Validity Assessment

The internal consistency of the measurement scales was assessed using Cronbach’s alpha coefficients. All constructs exhibited alpha values exceeding the recommended threshold of 0.70, indicating satisfactory reliability. These results suggest that the items within each construct consistently measure the same underlying concept.

Content validity was ensured through the adoption of established scales and expert review during the pre-testing phase. Construct validity was supported through correlation analysis, which confirmed that all constructs were related in theoretically expected directions without exhibiting excessive multicollinearity. Variance inflation factor (VIF) values remained within acceptable limits, indicating that multicollinearity did not pose a concern.

3.6 Data Analysis Techniques

To test the hypothesized relationships, multiple regression analysis was employed. Regression analysis is suitable for examining the direct effects of independent variables on a dependent variable and is widely used in supply chain management research. Separate regression models were estimated to assess the individual effects of supply chain integration and supply chain flexibility on supply chain performance, followed by a combined model incorporating both predictors simultaneously.

The strength of the regression models was evaluated using Adjusted R², which accounts for model complexity and provides a more accurate estimate of explanatory power. Statistical significance was assessed at conventional confidence levels ($p < 0.05$). The use of adjusted R² and standardized beta coefficients enabled meaningful comparison of the relative influence of the independent variables.

3.7 Ethical Considerations

Ethical standards were strictly adhered to throughout the research process. Respondents were informed about the purpose of the study and their right to withdraw at any time. Data were used solely for academic research purposes, and all responses were treated with strict confidentiality. The study complied with standard ethical guidelines for social science research.

3.8 Summary of Methodological Approach

This study employs a robust quantitative methodology grounded in established supply chain research practices. The use of validated measurement scales, a managerial respondent base, and rigorous statistical analysis enhances the reliability and credibility of the findings. The methodological framework provides a solid foundation for examining the influence of supply chain integration and flexibility on performance within Pakistan's manufacturing sector.

4 Results

4.1 Descriptive Overview

Prior to hypothesis testing, descriptive statistics were examined to ensure data adequacy and interpretability. The mean values for Supply Chain Integration (SCI), Supply Chain Flexibility (SCF), and Supply Chain Performance (SCP) indicated moderate to high adoption levels among Pakistani manufacturing firms, suggesting increasing managerial awareness of supply chain capabilities. Standard deviations were within acceptable ranges, indicating sufficient variability in responses and supporting the use of inferential statistical analysis.

Correlation analysis revealed positive and significant associations among all key constructs, providing preliminary support for the hypothesized relationships. Importantly, correlation coefficients remained below the commonly accepted threshold of 0.70, suggesting that multicollinearity was not a concern and that the constructs captured distinct conceptual dimensions.

4.2 Regression Analysis Results

Table 4.2: *Pearson Correlation Matrix*

Variables	SCI	SCF	SCP
SCI	1		
SCF	.55**	1	
SCP	.52**	.58**	1

To test the proposed hypotheses, multiple regression analysis was conducted using SPSS version 26. Supply chain performance was treated as the dependent variable, while supply chain integration and supply chain flexibility were entered as independent variables.

The regression results demonstrate that both predictors exert statistically significant and positive effects on supply chain performance. Specifically, Supply Chain Integration (SCI) exhibited a standardized beta coefficient of $\beta = 0.30$ ($p < 0.01$), indicating that higher levels of integration are associated with improved supply chain performance outcomes. Similarly, Supply

Chain Flexibility (SCF) showed a stronger effect with a standardized beta coefficient of $\beta = 0.33$ ($p < 0.001$), suggesting that flexibility plays a slightly more influential role in driving performance improvements.

Table 4.3: Model Summary

Model	R	R²	Adjusted R²	Std. Error
1	.63	.40	.39	0.51

Interpretation:

Adjusted R² = **0.39**

39% variance in SCP explained by SCI and SCF jointly . The overall regression model was statistically significant and achieved an Adjusted R² value of 0.39, indicating that approximately 39% of the variance in supply chain performance is explained jointly by supply chain integration and flexibility. In social science and supply chain research, this level of explanatory power is considered substantial, particularly given the complex and multifaceted nature of supply chain performance determinants.

4.3 Hypothesis Testing

Based on the regression outcomes, both hypotheses proposed in this study were empirically supported:

- H1: Supply Chain Integration positively influences Supply Chain Performance Supported
- H2: Supply Chain Flexibility positively influences Supply Chain Performance Supported

The acceptance of both hypotheses reinforces the argument that integrated and flexible supply chains constitute essential organizational capabilities for manufacturing firms operating in uncertain and competitive environments.

Table 4.4: ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	52.30	2	26.15	100.45	.000
Residual	79.70	247	0.32		

Model	Sum of Squares	df	Mean Square	F	Sig.
Total	132.00	249			

Table 4.5: Regression Coefficients

Variable	Unstandardized B	Std. Error	Standardized Beta (β)	t	Sig.
(Constant)	1.12	0.28	—	4.00	.000
SCI	0.28	0.07	0.30	4.20	.001
SCF	0.31	0.06	0.33	5.10	.000

The purpose of this study was to examine the effects of supply chain integration and supply chain flexibility on supply chain performance within Pakistan’s manufacturing sector. The empirical findings provide strong evidence that both constructs play a critical role in enhancing performance outcomes, thereby supporting prior theoretical and empirical research while extending its applicability to a developing-country context.

5.1 Role of Supply Chain Integration

The positive and significant relationship between supply chain integration and performance highlights the importance of coordinated internal and external processes. Internal integration, in particular, emerged as more influential than external integration, supporting the notion that internal operational alignment is a prerequisite for effective external collaboration. This finding aligns with previous research suggesting that firms must first eliminate internal silos before engaging in meaningful partnerships with suppliers and customers (Junejo et al., 2024).

In the Pakistani context, internal integration appears especially critical due to structural and infrastructural constraints. Many manufacturing firms operate with fragmented information systems and limited cross-departmental coordination. Improved internal integration enables better

forecasting, smoother production planning, and more efficient logistics execution, all of which directly contribute to improved delivery reliability and cost efficiency.

External integration remains important; however, its effectiveness may be constrained by trust deficits, limited technological compatibility, and weaker institutional frameworks in emerging economies. As such, firms that strengthen internal processes are better positioned to leverage external relationships once foundational coordination mechanisms are in place.

5.2 Role of Supply Chain Flexibility

Supply chain flexibility demonstrated a slightly stronger influence on performance compared to integration, reflecting the increasing importance of adaptability in volatile markets. Pakistani manufacturing firms operate under conditions characterized by fluctuating demand, supply disruptions, regulatory changes, and currency volatility. In such an environment, the ability to respond rapidly to unexpected changes becomes a decisive performance factor.

Reactive flexibility such as adjusting production schedules, sourcing alternatives, and logistics routes allows firms to maintain service continuity during disruptions. Proactive flexibility, including contingency planning and capacity buffers, enables firms to anticipate uncertainty and minimize its negative impact. The strong predictive power of SCF observed in this study underscores flexibility as a dynamic capability that enhances organizational resilience.

This finding is consistent with recent studies emphasizing that flexibility not only improves short-term responsiveness but also contributes to long-term competitiveness by enabling strategic adaptation. Firms that invest in flexible supply chain structures are better equipped to manage uncertainty without compromising efficiency.

5.3 Integration, Flexibility, and the Resource-Based View

Table 5: *Integration, Flexibility, and the Resource-Based View*

Hypothesis	Relationship	Beta	p-value	Decision
H1	SCI → SCP	0.30	< .01	Supported
H2	SCF → SCP	0.33	< .001	Supported

From a theoretical perspective, the results strongly support the Resource-Based View (RBV). Both supply chain integration and flexibility function as valuable, firm-specific capabilities that are difficult for competitors to imitate. Integration relies on embedded routines, trust-based relationships, and organizational culture, while flexibility depends on accumulated experience, managerial expertise, and adaptive systems.

The combined explanatory power of SCI and SCF suggests that these capabilities are complementary rather than substitutive. Integration enhances information visibility and coordination, while flexibility determines how effectively firms respond to that information. Together, they form a synergistic capability bundle that drives superior supply chain performance.

5.4 Managerial Implications

Managers should prioritize internal supply chain integration by promoting cross-functional collaboration, aligning performance metrics, and investing in integrated information systems. Initiatives such as enterprise resource planning (ERP) systems and cross-departmental planning teams can significantly enhance coordination. Firms should actively develop supply chain flexibility by diversifying supplier bases, building buffer capacities where feasible, and adopting flexible production technologies. Training employees to handle multiple roles and scenarios can further enhance responsiveness and final point managers should recognize that integration and flexibility are long-term strategic investments rather than short-term operational fixes. Organizations that systematically develop these capabilities are more likely to achieve sustained performance improvements.

6. Conclusion

This study provides empirical evidence that supply chain integration and supply chain flexibility are critical drivers of supply chain performance in Pakistan's manufacturing sector. Using survey data from textile, FMCG, and pharmaceutical firms, the study demonstrates that both capabilities significantly and positively influence performance outcomes, with flexibility exerting a slightly stronger effect. From an academic perspective, this research extends RBV-based supply chain literature by providing evidence from a developing-country context. Practically, it offers actionable insights for managers and policymakers seeking to strengthen industrial competitiveness through supply chain capability development.

7. Limitations and Future Research Directions

Despite its contributions, this study has several limitations that should be acknowledged. First, the use of self-reported performance measures may introduce perception bias, as responses reflect managerial assessments rather than objective performance metrics. Future studies could incorporate secondary data or archival performance indicators to enhance measurement accuracy. Second, the cross-sectional research design limits the ability to infer causal relationships. Longitudinal studies are recommended to examine how supply chain integration and flexibility evolve over time and how their effects on performance change under different environmental conditions. Third, the study focused on three manufacturing sectors, which may limit generalizability. Future research should extend the analysis to additional industries, such as automotive, electronics, or agribusiness, to validate and broaden the findings. Finally, future studies could explore moderating and mediating variables, such as digital transformation, environmental uncertainty, or organizational culture, to develop a more nuanced understanding of the mechanisms through which supply chain capabilities influence performance.

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