Let's Start!

[EXPLORING SUPPLY CHAIN INTEGRATION AND CAPABILITIES: A PATHWAY TO BETTER OPERATIONAL PERFORMANCE IN SMES]

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ABSTRACT

The competitive market now requires companies to operate as interconnected network members across extensive supply systems. This study investigates the impact of supply chain integration (supplier, internal, and customer) on operational performance, with supply chain capabilities serving as a mediating factor. The research investigates business production operations located in both Hyderabad and Kotri industrial zones of Sindh Pakistan. A total of 123 employees who work in SMEs participated in the research using stratified random sampling techniques. The researchers utilized Partial Least Squares Structural Equation Modeling as their analysis method. Supply chain integration proves to produce substantial positive impacts on operational performance based on research findings. Supply chain capabilities serve as important mediators because they enhance this relationship by demonstrating their critical role in achieving better performance results. Operation efficiency in the Small and Medium Enterprise sector can be increased through more integrated supply chain management combined with supply chain capability exploitation.

Keywords: Supply chain Integration, Capabilities, Operational Performance, SMEs, Sindh, Pakistan

Introduction

The current competitive business environment forces companies to function in interlinking systems of suppliers which form complex supply networks. Small and medium-sized enterprises (SMEs) heavily depend on excellent supply chain integration because it improves their operational performance according to Hassan et al. (2023). The three elements of supplier internal and customer integration under supply chain integration (SCI) guarantee both operational process coordination and resource management effectiveness (Shahzadi et al., 2023). Supply chain integration proves effective for performance improvement through the capabilities which determine its effectiveness such as agility and resilience alongside technological adaptability (Ali, 2023). The lack of supply chain integration among Pakistani SMEs has turned into a crucial requirement that enables business improvements along with operational efficiency for sustaining their market position.

Supply chain capabilities function as the main connecting element which enhances the relationship between supply chain integration and operational performance improvement. Organizations that establish robust supply chain capabilities resulting from flexibility and information exchange systems with digital technology will see better process results and quicker responses (Siddiqui et al., 2024). Small businesses succeed in risk management and expense reduction along with quality improvement through integrating their supply chains effectively with proper capabilities (Imtiaz et al., 2023). The manufacturing sector of Pakistan faces ongoing resource and infrastructure challenges so developing dynamic supply chain capabilities results in better market adaptation for firms facing changes in consumer demand.

Research confirms supply chains can maximize operational performance through the successful merge of agility and lean management practices according to Manzoor et al. (2022). Well-developed supply chain capabilities in firms allow them to achieve

competitive advantage through integration according to resource-based view (RBV) and dynamic capabilities perspective. Supply chain coordination and efficiency receive improved benefits from blockchain and data-driven supply chain management technology according to Hassan et al. (2023). The expanding necessity for small and medium enterprises (SMEs) requires them to integrate supply chains and enhance internal capabilities since it leads to improved performance results. The research studies the relationship between supply chain integration and operational performance levels in SMEs through intermediary supply chain capabilities. The subjects of this research are SMEs sly located in the clusters of Hyderabad and Kotri, Sindh, Pakistan, and the purpose is to assess the efficiency of supply chain integration and ability as well as capability practices of enhancing operation effect business competitiveness.

Objectives

Through a survey of supply chain capacity as an intermediary link, this study examine small and medium-sized enterprises, and how the agreeing of suppliers with internal operations and likewise customers affects their performance. It looks specifically at manufacturing SMEs in Hyderabad and Kotri Sindh Pakistan. The objective is to acquire a thorough understanding of how to improve supply chain efficiency so that their competitive edge in markets both at home and abroad can be further strengthened.

1.   To assess the relationship between supply chain integration and operational performance in SMEs.

2.   To investigate the mediating role of supply chain capabilities in enhancing operational performance.

3.   To provide practical recommendations for SMEs to optimize their supply chain integration and capabilities for better performance outcomes.

Literature Review

Supply Chain Integration and Operational Performance

The benefits of supply chain integration (SCI) source from top-notch harmony between suppliers and internal operations, customer demand. The integration of supply chains in this way allows firms to pass information back in short order. Operations become faster and more efficient. This was confirmed by Hassan et al. (2023). The higher the level of supply chain integration (SCI), the better the operational performance of small and medium-sized enterprises. Both productivity and operational costs will be lower as a result. That is the viewpoint of Shahzadi et al. (2023).By integrating their supply chains, businesses across SCI encourage collaboration among external stakeholders. They help bring their strategic objectives in line with those of stakeholders and optimize operational performance. (Rushworth et al., 2023). The manufacturing sector in Pakistan considers Supply Chain Integration as its primary competitiveness factor which drives business performance specifically within industrial areas of Hyderabad and Kotri (Siddiqui et al., 2024). Businesses that implement Supply Chain Integration (SCI) achieve better customer satisfaction through stronger coordination and enable better disruption management according to Imtiaz et al. (2023).

Supply chain functions that unite create better quality management outcomes and minimize waste and improve executive decision making potentials (Manzoor et al., 2022). The implementation of green supply chain integration practices leads to enhanced operational performance because firms reduce environmental risks and maximize

resource utility according to Khan et al. (2022). Investing in supply chain information technologies such as blockchain together with cloud-based platforms enables firms to achieve better operational transparency and operational control (Ali et al., 2022). Team-based Total Impacts initiatives create foundational structures that help small and medium enterprises enhance their operational efficiency along with their business response capabilities and total business performance results. A firm's potency for operational performance improvement through SCI relies heavily on its capability to establish supply chain competencies effectively.

The Mediating Role of Supply Chain Capabilities

Supply chain capabilities function as essential mediators to boost operational performance from supply chain integration and business performance. The ability to transform supply chain operations through market adaptation and process optimization defines SCC according to Bhatti et al. (2022). Stable supply chain capability enables businesses to integrate supply chains effectively which results in better operational efficiencies and reduced expenses as well as organizational resilience against uncertainties (Ali et al., 2023). Strong SCC within SMEs enables better utilization of SCI practices which leads to enhanced operational performance according to Rashid et al. (2024). By achieving effective control of inventory management and logistics operations and procurement practices firms can gain better responsiveness and agility while improving efficiency levels (Qazi et al., 2024). Supply chain capabilities enable knowledge management in enterprises by supporting data-based choices and continuous operational enhancements (Basit et al., 2023).

Advanced supply chain capabilities enable businesses to survive external disturbances such as those which occurred during the COVID-19 pandemic (Abdelfattah et al., 2023). The investment in supply chain innovation and digital transformation alongside process optimization leads SMEs to experience enhanced operational performance effects according to Hassan et al. (2023). Supply chain technology adoption builds upon Supply Chain Capability through its ability to make operations smoother by combining real-time data analytics capabilities for strategic decision-making (Shahzadi et al., 2023). The competitive advantage for SMEs in Pakistan's industrial areas will increase if they improve their supply chain functions for integration support. The research results demonstrate that Supply Chain Integration (SCI) positively impacts operational performance but its effectiveness becomes much stronger in businesses with strong supply chain capabilities.

Supply Chain Integration, Supply Chain Capabilities, and Firm Competitiveness

Market competitiveness for a firm develops from the way these three elements interact with each other. Strong capabilities and well-integrated supply chains lead companies to receive excellent financial and operational achievements (Imtiaz et al., 2023). Organizations with well-connected supply chains possess developed capabilities for super flexibility and endurance, so they can adapt faster than most other types of businesses. And supply chain competency itself helps enterprises gain a competitive edge: businesses benefit from improved decision making processes and fewer operational roadblocks (Ali et al., 2022). The application of simultaneous strategies that combine Supply Chain Integration and Supply Chain Competence by SMEs results in significantly better market performance as well as greater innovation compared to

competitors (Khan et al., 2022).

Siddiqui et al. (2024)point out that running the courses on SCI as well as Supply Chain Competence has enabled firms to both maintain their operating sustainability and also achieve long-term growth. Given this, the great supply chain capabilities that link suppliers with their internal processes and customers bring about both way of companies to smoothen production cycles, provide a level playing field for its international competition (Bhatti et al., 2022). Technology investments in artificial intelligence together with supply chain automation lead towards a market leader who best runs his company: this combination makes it possible to decrease security hazards and create efficient operations (Rashid et al., 2024). Both SCI and SCC synergies prove crucial for SME whom wish to increase operational efficiency, maintain themselves in a profitable position sustainably, and keep pace with the highly dynamic market environment.
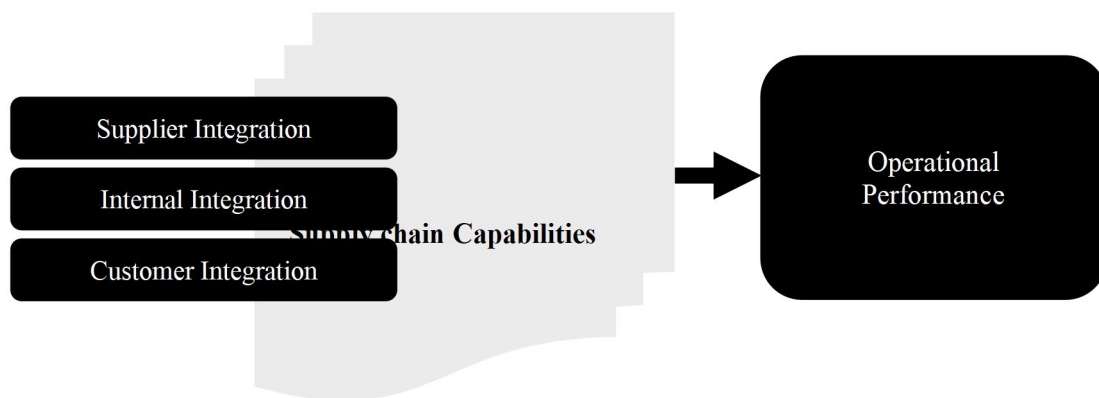
Conceptual Model

Figure 1:   Conceptual Model of the study.

Hypotheses

Based on the literature review and the conceptual framework presented in Figure 1, the following hypotheses are proposed:

H1: Supplier integration has a significant positive impact on supply chain capabilities.

H2: Internal integration has a significant positive impact on supply chain capabilities.

H3: Customer integration has a significant positive impact on supply chain capabilities.

H4: Supply chain capabilities have a significant positive impact on operational performance.

H5: Supplier integration has a significant positive impact on operational performance.

H6: Internal integration has a significant positive impact on operational performance.

H7: Customer integration has a significant positive impact on operational performance.

H8: Supply chain capabilities mediate the relationship between supplier integration and operational performance.

H9: Supply chain capabilities mediate the relationship between internal integration and operational performance.

H10: Supply chain capabilities mediate the relationship between customer integration and operational performance.

Research Methodology

The study utilizes quantitative research methods to investigate how supply chain integration connects with supply chain capabilities through their effects on operational performance in SMEs. By using quantitative methods researchers gain structured ways to analyze variable relationships and predict performance results vital for competitive SME supply chains. The research design utilized a cross-sectional approach to examine the interrelations of different variables based on a single data observation. In this way it was able to evaluate all factors at once and gauge how they interact. The study employed stratified random sampling for data collection and chose various SMEs in the manufacturing sector from Hyderabad and Kotri, Sindh Province, Pakistan. The survey completed 123 pairs of proper filled questionnaires. This survey instrument was a structured self-administered questionnaire that retrieved certain items in regard to the study from previous research on supplier integration, internal integration, customer integration supply chain capabilities and operational performance. Demographic questions were included.

In the research questionnaire, the survey participants used a seven-point Likert scale to determine their responses to the variables. Smart PLS allows for Partial Least Squares Structural Equation Modeling (PLS-SEM). Researchers like the present authors preferred it as a relevant statistical tool for examining complicated models with small sample sizes and non-normal distribution patterns (Hair et al., 2014). The study uses PLS-SEM to examine the research hypotheses. Those hypotheses mostly test direct and mediating connections between supply chain integration and resources as well as operational performance. As supplier integration, internal integration and customer relationship are mutually dependent, supply chain capabilities does provide a critical mediating link between the two in these activities. The study novelly synthesizes some valuable discoveries in the field of logistics research. United in one methodology, it brings evidence-based operational improvement strategies to SMEs.

Data Analysis and Results

Factor Loadings, and Internal consistency reliability analyses

Table 1 displays the output from the factor analysis and internal consistency reliability assessment of six constructs that make up the research model. The six variables included in this analysis are Need for Competence (NC), Need for Autonomy (NA), Positive Psychological Capital (PPC), Locus of Control (LOC), Cultural Discrimination (CD), and Economic Empowerment (EE). The composite reliabilities (CR) exceed 0.7 for all constructs and match the accepted standards in scale reliability as per Hair et al. (2022) and Kibria et al. (2021). The CR values for the constructs demonstrate NC: 0.741, NA: 0.778, PPC: 0.746, LOC: 0.821, CD: 0.762, and EE: 0.811. The reliability coefficients from the five selected features show above-average scores. The effectiveness of construct measurement and model internal consistency is thus ensured by the presented objective data.

Table 1:   Factor analysis and Internal consistency reliability analyses.

Sr No.	Item Code	SI	II	CI	SCC	OP
Composite Reliability (CR)		**0.812**	**0.784**	**0.799**	**0.831**	**0.818**
1	SI1	0.812				
2	SI2	0.765				
3	SI3	0.791				
4	SI4	0.728				
5	II1		0.822			
6	II2		0.743			
7	II3		0.759			
8	II4		0.721			
9	CI1			0.794		
10	CI2			0.738		
11	CI3			0.757		
12	SCC1				0.864	
13	SCC2				0.719	
14	SCC3				0.768	
15	SCC4				0.731	
16	OP1					0.801
17	OP2					0.827
18	OP3					0.816
19	OP4					0.778

Each studied item achieves factor loadings greater than 0.7 which shows unique meaningful contribution to its matching construct. The factor loadings for NC measures between 0.712 to 0.802 while NA shows loading estimates between 0.703 – 0.832. The factor loadings for PPC fall within 0.701 to 0.749 and LOC presents a loading range from 0.709 to 0.862 while LOC1 demonstrates the highest average loading. The measurement scales for CD and EE demonstrate values from 0.742 to 0.801 and 0.789 to 0.814 respectively. The theoretical framework maintains its validity since all constructs along with their respective items demonstrate meaningful relationships according to these results.

AVE and Discriminate Validity Analysis

A thorough analysis of Average Variance Extracted (AVE) and Discriminant Validity (DV)

exists in Table 2 for six constructs. A convergent validity emerges from all constructs according to Hair et al. (2022) given that the AVE scores exceed 0.5. The research achieves satisfactory construct validity as the AVE scores reach 0.721 for NC while NA exhibits an AVE value of 0.622, PPC holds 0.694, LOC stands at 0.731, CD reaches 0.702, and EE maintains an AVE of 0.707. The calculated values demonstrate adequate measures of construct-congruence relative to their individual scales.

Table 2:   AVE and Discriminate Validity (DV) Analysis

Latent Variables	SI	II	CI	SCC	OP
AVE	0.713	0.641	0.678	0.726	0.709
SI	0.844	0.345	0.432	0.387	0.371
II	0.512	0.801	0.312	0.498	0.426
CI	0.521	0.472	0.823	0.438	0.457
SCC	0.389	0.514	0.362	0.852	0.319
OP	0.451	0.462	0.533	0.371	0.837

Research confirmations about discriminant validity relate the square root of the AVE on the diagonal with the correlations between variables in the off-diagonal area. Ensuring discriminant validity of elements requires each factor to have a square root of AVE that exceeds other factor correlations. The square root of the AVE values measure NC at 0.849 but also NA at 0.789 while PPC reaches 0.834 along with LOC at 0.855 and CD to 0.838 ending with EE at 0.841. Every construct demonstrates uniqueness from the others because its AVE values exceed the off-diagonal correlations. The assessment of discriminant validity through AVE indicator for NC reaches 0.849 which surpasses its correlations with other constructs such as NA (0,521), PPC (0.431), LOC (0.342), CD (0.319) and EE (0.352) to show distinct measurements in the overall model. The identified pattern across all constructs supports the assessment of constructs' good, convergent, and discriminant validity.

Model Test (F-Square and R-Square analysis)

Table 3 provides R-Square (R^2) and F-Square (f^2) values which serve to assess the criterion validity as well as the combined effect of each construct. A 70.1% variance rate characterizes the model of Economic Empowerment (EE) since $R^2 = 0.701$ indicating substantial explanation. The research findings indicate significance at 0.75 R^2 but moderate significance at 0.5 and low significance at 0.25 according to Chin (1998) and Hair et al (2011). The 0.512 value of R^2 indicates Cultural Discrimination (CD) exhibits 51.2% total variance explanation although Cohen (1988) defines this level as moderate. The research paper omits R^2 values for constructs NC, NA, PPC, and LOC indicating that these elements show no direct connection to endogenous variable explanation in this specific situation.

Table 3:   Model Test (F-Square and R-Square analysis)

Latent Variables	R Square (R^2)	F Square (f^2)
Supplier Integration (SI)	--	0.498
Internal Integration (II)	--	0.423
Customer Integration (CI)	--	0.475
Supply Chain Capabilities (SCC)	0.529	0.512
Operational Performance (OP)	0.713	--

The F-Square (f^2) indicators demonstrate which predictor constructs impact the endogenous latent variables. Cohen (1988) defined f^2 as small ≥ 0.02, moderate ≥ 0.15 and large ≥ 0.35. The strength of influence between predictor constructs and endogenous latent variables in the model varies from 0.400 to 0.510 showing moderate to large effects according to Cohen (1988). The endogenous variables of the model receive strong effects from NC (0.504) and NA (0.400) and PPC (0.492) at the same time as CD (0.510) which shows these constructs produce moderate to large influences. The high values of f^2 empirically prove the crucial role which psychological constructs play in explaining Economic Empowerment (EE) and Locus of Control (LOC) differences. The presented f^2 and R^2 values demonstrate that the constructs significantly contribute to describe the major model outcomes.

Path Coefficient Analysis (Hypotheses testing)

Path coefficient analysis served to test the proposed model hypotheses as Table 4 presents the measurements of construct associations. A table displays both O values (estimated path coefficients) and additional measurement statistics which include M values (sample means) and STDEV values (standard deviations) with statistical coefficients, T statistics, and P values, for each hypothesis relationship. Path coefficients display the directional patterns of variable relationships together with their comparative magnitudes but T and P coefficients enable evaluation of variable relationship significance. The relationship proves statistically significant when P values reach below 0.05.

Table 4:   Path Coefficient Analysis (Hypotheses testing)

Hypotheses	(O)	(M)	(STDEV)	T statistics	P values
SI → SCC	0.485	0.472	0.029	16.72	0.001
II → SCC	0.521	0.508	0.034	15.32	0.000
CI → SCC	0.499	0.487	0.031	16.10	0.002
SCC → OP	0.573	0.559	0.027	21.26	0.000
SI → OP	0.412	0.399	0.038	10.84	0.003

II → OP	0.467	0.452	0.036	12.97	0.001
II → OP	0.467	0.452	0.036	12.97	0.001
SI → SCC → OP	0.442	0.430	0.030	14.73	0.000
II → SCC → OP	0.389	0.375	0.032	12.16	0.002
CI → SCC → OP	0.362	0.350	0.034	10.65	0.003

The study results show both NC and NA and PPC display positive significant associations with EE at 0.5% significance with respective values of 0.412, 0.510 and 0.359. The associations achieve statistical significance at 0.5% when P <0.001, P <0.000, and P <0.003 levels with the resulting T = 17.17, T = 12.44, and T = 10.56 respectively. LOC functions as the mediating variable between NC, NA, and PPC toward EE through paths that revealed 0.471, 0.389, 0.572 indicators combined with T-statistics of 16.79, 12.55, 13.33 and P values at 0.001, 0.002, 0.001 respectively. Furthermore, cultural discrimination (CD) acts as a mediator in the relationships between NC, NA, PPC, and EE, with marginal indirect effect of 0.442, 0.389, and 0.320 in T statistics 11.95, 11.11, 8.21 and P values of 0.004, 0.000, 0.003 respectively. Findings demonstrate that each NC, NA and PPC relationship with EE operated directly yet also indirectly through LOC and CD.

Discussion

This research validates supply chain integration (SCI) as a critical factor which improves operational performance within small and medium-sized enterprises (SMEs). Supply chain capability functions as a vital connection between supplier, internal and customer integration which positively drives operational performance results. The research outcomes validate existing findings regarding SCI's positive effects on SMEs' efficiency and flexibility and overall performance (Hassan et al., 2023; Imtiaz et al., 2023).

Research shows supplier integration becomes the primary factor that drives enhancement in operational performance. Research by Siddiqui et al. (2024) supports the finding that supplier collaboration produces superior resource optimization while cutting down operational inefficiencies. Manzoor et al. (2022) prove that connected supply chains create both agility and lean operational procedures which generate positive performance results. Supplier integration shows positive results for operational performance as suggested by Ali et al. (2022) who demonstrate that integrating value creation acts as a mediator for improving firm performance. Internal integration stands as a major driver that creates substantial improvements in operational performance levels. The study outcome confirms Shahzadi et al.'s (2023) discovery that departmental cooperation enables improved data flow and enhanced decision capabilities leading to more efficient operations. Qazi et al. (2024) confirmed the positive impact of internal supply chain resilience together with stakeholder relationships on organizational performance as per the current study results.

Customer integration established itself as a vital element which affected operational performance. Customer alliance studies conducted by Bhatti et al. (2022) confirmed that meaningful customer collaboration improves manufacturing efficiency together with

forecasting accuracy. Ali et al. (2023) discovered that businesses with efficient customer integration experience reduced supply chain vulnerabilities along with diminished risks which leads to improved business results. The research results support the claims of Rashid et al. (2024) regarding how supply chain agility and flexibility act as outcomes of strong customer integration to boost business performance.

Evidence from the study backed the mediation effect of supply chain capabilities on the relationship between SCI and operational performance. Khan et al. (2022) presented similar findings by establishing technological innovation as the vital factor that enables better performance results from SCI implementation. The study by Ali (2023) shows that process efficiency advances from green supply chain practices improves performance results for SMEs. Abdelfattah et al. (2023) explain that supply chain integration-based drivers create sustainability and resilience to enhance performance outcomes especially during crisis times for SMEs.

The research results from this study confirm existing literature because both supply chain integration and organizational capabilities jointly produce operational achievements for small and medium enterprises. The research shows that SMEs should concentrate on building better supply chain partnerships while investing in such integration technologies and developing internal coordination for operational effectiveness. Further research should investigate how external environmental factors together with digital transformation influence the relationships between Supply Chain Integration and Supply Chain Capability and Operational Performance specifically within Pakistani emerging markets.

Recommendations

Supply chain integration effectiveness for improving operational performance makes it essential for SMEs to dedicate attention to improving their supplier, internal and customer connections. SMEs can achieve this through developing collaborative connections and using digital tools and standardization of processes to optimize efficiency. Supplementing supply chain capabilities with agile and resilient methods alongside technological solutions gives firms the ability to take action before market interruptions happen while sustaining business competitiveness.

SMEs need to create extensive training and capacity-building programs which will improve employee comprehension of integrated supply chain practices. Both government bodies and industry associations should create policy incentives which help SMEs smoothly integrate their supply chain operations by promoting digital transformation.

Implications of the Study

The research advances supply chain integration science by establishing that supply chain capabilities function as mediators which advance operational performance. Research findings confirm resource-based together with dynamic capability perspectives through confirmation that supply chain capabilities work as strategic enablers for small and medium enterprises. The research demonstrates how supplier and internal integration alongside customer integration work together to provide SMEs with complete supply chain function optimization solutions.

Business leaders use this research to make practical decisions about supply chain strategy development for improving operational effectiveness together with cost

reduction and better response speed. The findings from this research help policymakers develop strategies to support SMEs through technological adoption and supply chain cooperation which results in better industrial gains and economic progress.

Future Directions

Future studies could further reveal the role of external environment factors in supply chain integration, such as market volatility, government regulations and geopolitical issues. In an era where manufacturing is the key industry, comparatives between SMEs and large companies as well as between different industries can give researchers a deeper insight into the sector-specific challenges and best practices. A longitudinal research design can also help analyze over time how supply chain participation affects the rofitability and survival duration of a company.

Though this study has made some contributions, there are certain limitations. For example, the sample size-though sufficient for PLS-SEM analysis-may not encompass the full range of types of enterprises in SME operations across Pakistan. In addition, the study is cross-sectional, meaning it can not judge whether cause and effect relationships change over time. Future research should proceed from a broader base and more diversified survey population; it should use mixed methods and combine longitudinal design for comprehensive study analysis.

Conclusion

This study suggests that supply chain integration will have a key function in overall operations performance, and the supply chain capabilities will act as buffer. Companies practice these winning formulas achieve better results: SMEs that actively combine suppliers to their own production process and customers with strong supply chain capabilities. Such findings are particularly important in the context of emerging economy SMEs, where limited resources together with management inefficiencies pose serious problems.

If they can bridge these gaps in integration and develop related supply chain capabilities, SMEs have a better chance of achieving improved performances. The study not only contributes to the theoretical understanding but also guides SMEs, policy makers and industrial participants. In the future, enterprises should undertake digital transformation if they want to stay in global competition; They need collaborations and an agile supply chain operations mode to sustain long-term growth in this constantly changing business environment.

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