
RESILIENT SUPPLY CHAIN CAPABILITIES AND SMEs PERFORMANCE IN SOUTH-EAST NIGERIA

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Abstract

Small and medium enterprises (SMEs) operate in supply environments characterised by uncertainty, resource constraints and recurring disruptions. In such environments, the capacity to adapt operations, manage supply chain risks and deploy technology strategically may determine whether firms maintain performance or experience prolonged operational difficulties. This study examined the effects of supply chain flexibility, supply chain risk management and supply chain technology adoption on the performance of SMEs in South-East Nigeria. The study adopted a quantitative survey design and analysed data obtained from 325 valid SME responses. Structural equation modelling was used to evaluate the measurement and structural models. The findings show that supply chain flexibility has a significant positive effect on SME performance ($\beta = 0.30$, $p < 0.001$). Supply chain risk management emerged as the strongest predictor of performance, with a significant positive effect ($\beta = 0.37$, $p < 0.001$). However, supply chain technology adoption did not have a significant direct effect on SME performance ($\beta = -0.05$, $p = 0.52$). The findings suggest that adaptive and risk-oriented capabilities have more immediate performance implications for SMEs than technology adoption considered in isolation. The study argues that technology should be integrated with organisational capabilities and supply chain processes rather than treated as an automatic route to improved performance. The article contributes to supply chain resilience research by examining the combined effects of operational adaptability, risk management and technology adoption within the SME context of South-East Nigeria. Practical implications are provided for SME managers, policymakers and supply chain practitioners.

Keywords: Supply chain flexibility; supply chain risk management; technology adoption; SME performance; supply chain resilience; South-East Nigeria

1. Introduction

Small and medium enterprises are important contributors to economic activity, employment and entrepreneurship in emerging economies. Their importance, however, does not remove the operational challenges associated with their relatively limited resources. SMEs frequently operate with constrained working capital, small management teams, limited bargaining power and a narrow base of suppliers. These characteristics can make supply chain disruptions particularly costly. When a supplier fails, logistics arrangements change or customer demand shifts unexpectedly, an SME may have fewer alternatives than a large corporation.

The increasing volatility of business environments has therefore intensified interest in supply chain resilience. Supply chain resilience is generally concerned with the ability of supply chains to anticipate, absorb, adapt to and recover from disruptions while sustaining operations and value creation (Christopher & Peck, 2004; Ponomarov & Holcomb, 2009). While resilience is sometimes presented as a broad organisational outcome, the literature increasingly recognises that it is built through specific capabilities. Firms become more resilient because they develop the capacity to adjust, identify and manage risks, coordinate resources and use information effectively.

This article focuses on three capabilities that are particularly relevant to the SME context: supply chain flexibility, supply chain risk management and supply chain technology adoption. Flexibility concerns the ability of a firm to alter supply chain processes, resources and arrangements when conditions change (Stevenson & Spring, 2007). Risk management involves the systematic identification, assessment and mitigation of threats that may interrupt supply chain operations (Manhart et al., 2020). Technology adoption relates to the use of digital and technological tools to improve supply chain visibility, information processing and operational coordination. Together, these capabilities represent three different approaches to managing uncertainty: adaptation, prevention and technological enablement.

The relevance of these capabilities is particularly clear in the context of SMEs. A flexible SME may adjust its sourcing, production or distribution arrangements when conditions change. An SME with stronger risk management practices may identify supply vulnerabilities before they become serious disruptions. Technology may help the firm improve visibility and information flow. However, the relationship between technology adoption and performance is not necessarily automatic. The value of technology may depend on organisational readiness, employee capability, process integration and strategic alignment.

Existing studies have established the relevance of supply chain flexibility and risk management to resilience and firm performance. Stevenson and Spring (2007) identify flexibility as a central supply chain capability, while Brusset and Teller (2017) show that flexibility contributes to resilience. Research on supply chain risk management similarly suggests that risk identification and mitigation can protect performance during disruption (Manhart et al., 2020; Munir et al., 2020). Technology research, on the other hand, has produced more mixed implications. Some studies demonstrate that digital technologies improve supply chain visibility and capability, whereas others suggest that technology adoption alone may not generate performance benefits without appropriate integration.

The empirical findings from the wider study on which this article is based provide a particularly interesting basis for a focused article. Supply chain flexibility was found to have a significant positive effect on SME performance, while supply chain risk management emerged as the strongest predictor of performance. In contrast, technology adoption had a negative but statistically insignificant direct effect. These results raise an important research question: why do adaptive and risk-management capabilities appear to have stronger direct performance implications than technology adoption among SMEs in South-East Nigeria?

The present article addresses this question by isolating three variables from the broader supply chain resilience model. It examines whether flexibility, risk management and technology adoption influence SME performance and discusses the implications of the observed differences in their effects. The article is deliberately distinct from the original dissertation and the first article developed from the dissertation. Rather than examining supply chain resilience through a broad set of dimensions, it focuses on the tension between operational adaptation, risk-oriented capability and technology adoption.

The study makes three contributions. First, it provides a focused examination of three resilience-related capabilities that are often discussed separately. Second, it contributes empirical evidence from SMEs in South-East Nigeria, a context that remains underrepresented in the resilience literature. Third, it offers a theoretically informed interpretation of the non-significant direct effect of technology adoption, suggesting that technology may require complementary organisational capabilities before its value is translated into performance.

The remainder of the article is structured as follows. The next section reviews the relevant literature and develops the hypotheses. The theoretical foundation and research gap are then discussed. The methodology, results and discussion follow. The article concludes with theoretical implications, managerial implications and recommendations.

2. Literature Review

2.1 Supply Chain Resilience and SME Performance

Supply chain resilience has become an important concept in operations and supply chain research because of the increasing frequency and complexity of disruptions. Early work positioned resilience around the ability of supply chains to return to a stable state after an unexpected event (Christopher & Peck, 2004). Ponomarev and Holcomb (2009) broadened the concept by emphasising the capacity to prepare for, respond to and recover from disruptive events. Contemporary discussions increasingly present resilience as a dynamic process involving adaptation, reconfiguration and learning (Wieland & Durach, 2021).

The resilience-performance relationship is particularly important for SMEs. Large firms may use financial reserves, alternative facilities or extensive supplier networks to absorb disruptions. SMEs generally have less slack and may be more dependent on particular suppliers or customer segments. Consequently, resilience capabilities may influence not only the firm's ability to recover from disruption but also its everyday performance. A firm that is capable of adjusting operations and identifying risks may experience fewer interruptions, lower avoidable costs and more stable customer service.

The present study does not treat resilience as a single aggregate construct. Instead, it focuses on flexibility, risk management and technology adoption as distinct capabilities. This approach is consistent with the argument that resilience is developed through multiple organisational and supply chain capabilities. The three dimensions are conceptually different: flexibility enables adaptation, risk management supports anticipation and mitigation, while technology may provide tools and information for improving supply chain processes.

2.2 Supply Chain Flexibility

Supply chain flexibility refers to the ability of a supply chain to adjust its processes, resources and activities in response to changing conditions. Stevenson and Spring (2007) describe flexibility as a multidimensional concept that may involve changes in products, volumes, processes and delivery arrangements. Flexibility therefore concerns the range of options available to a firm and the firm's capacity to move between those options.

The importance of flexibility is evident in uncertain markets. A firm with rigid sourcing arrangements may be unable to respond when a supplier experiences difficulty. Similarly, a business with inflexible production or distribution systems may be unable to respond to changing customer requirements. Flexible supply chains, by contrast, can reconfigure activities and redeploy resources. This capacity can reduce the duration and severity of disruptions.

Flexibility is especially relevant to SMEs because it can provide an alternative to resource-intensive resilience strategies. An SME may not be able to maintain multiple warehouses or large safety stocks, but it may be able to develop alternative sourcing arrangements or adjust its operations. Tiwari et al. (2020) emphasise the relevance of supply chain flexibility to SMEs, while Kazancoglu et al. (2022) associate flexibility with resilience in disruptive environments.

The performance value of flexibility is also supported by empirical research. Brusset and Teller (2017) show that flexibility contributes to resilience and performance outcomes. Jafari et al. (2023) demonstrate the relationship between supply chain flexibility and customer responsiveness, while Al Azzani and Jusoh (2024) connect flexibility with customer responsiveness among SMEs. Nigerian evidence also suggests that flexible supply chain practices contribute to firm performance (Ayeti et al., 2026; Chiyem & Etomi, 2024).

In the wider dissertation study, supply chain flexibility had a significant positive effect on SME performance ($\beta = 0.30$, $p < 0.001$). The result suggests that firms capable of adjusting operations and resources are better positioned to maintain performance under uncertain conditions. Based on this literature and the empirical evidence, the study hypothesises that:

H1: Supply chain flexibility has a significant positive effect on the performance of SMEs in South-East Nigeria.

2.3 Supply Chain Risk Management

Supply chain risk management refers to the systematic process of identifying, assessing, monitoring and mitigating risks that may disrupt supply chain operations. Risks may arise from suppliers, logistics, demand fluctuations, financial conditions, infrastructure and external events. The central objective of supply chain risk management is not necessarily to eliminate all risks, which may be impossible, but to reduce the probability and impact of disruptive events.

Risk management is particularly important for SMEs because the consequences of a disruption may be disproportionate to the size of the firm. A large organisation may absorb a temporary supply interruption, whereas an SME may experience immediate cash-flow and customer-service problems. Proactive risk identification may therefore help SMEs prepare for possible disruptions and develop appropriate responses.

Manhart et al. (2020) distinguish between buffering and bridging strategies in supply chain risk management and show that risk management practices have implications for firm performance. Munir et al. (2020) further demonstrate the relationship between supply chain risk management and operational performance, with supply chain integration playing an enabling role. More recent research emphasises risk management as an important foundation for resilience in disruptive environments (Madzik et al., 2024).

Risk management can influence performance through several mechanisms. First, it can reduce unexpected operational losses. Second, it can support continuity by encouraging contingency planning and alternative arrangements. Third, it can improve managerial

awareness of vulnerabilities. In the SME context, risk management may also encourage managers to move from reactive problem-solving to more deliberate supply chain planning.

The findings of the wider study provide strong support for this relationship. Supply chain risk management emerged as the strongest predictor of SME performance ($\beta = 0.37$, $p < 0.001$). The result suggests that firms that proactively identify, assess and mitigate supply chain risks are more likely to achieve stability and stronger performance. Accordingly, the study proposes:

H2: Supply chain risk management has a significant positive effect on the performance of SMEs in South-East Nigeria.

2.4 Supply Chain Technology Adoption

Technology adoption in the supply chain refers to the integration and use of technological tools to support supply chain activities. These technologies may include enterprise resource planning systems, digital communication tools, analytics, automation and other technologies that improve information processing and operational visibility. Technology has attracted considerable attention because digital systems can potentially connect supply chain partners and improve the speed and quality of decisions.

The theoretical argument for technology adoption is straightforward. Better information may improve visibility, enable more accurate planning and support faster responses. Technology can also reduce manual processes and support coordination across supply chain activities. Huang et al. (2023) argue that Industry 4.0 technologies can enhance supply chain capabilities and resilience, while Zhao et al. (2023) highlight the contribution of AI analytics and blockchain to visibility and operational flexibility.

However, the performance implications of technology adoption are not necessarily direct. Technology may require financial investment, employee training and changes to existing processes. A firm may acquire a technology but fail to use it effectively. Gölzer et al. (2025) emphasise the importance of strategic capabilities and holistic organisational approaches in obtaining value from technology. Technology adoption without organisational readiness may therefore create costs without producing immediate performance gains.

This issue is particularly important for SMEs. Smaller firms may adopt technology in a fragmented manner or use basic systems without integrating them into broader supply chain processes. The wider study found that technology adoption had a negative but statistically insignificant direct effect on SME performance ($\beta = -0.05$, $p = 0.52$). The finding suggests that technology adoption, when considered independently of complementary capabilities, may not automatically improve performance.

The non-significant result does not imply that technology is irrelevant. Rather, it raises the possibility that technology's performance value may be indirect. Technology may improve performance by strengthening flexibility, risk management or other capabilities. The present study nevertheless tests the direct relationship identified in the original empirical model. The hypothesis is therefore stated as:

H3: Supply chain technology adoption has a significant positive effect on the performance of SMEs in South-East Nigeria.

2.5 Theoretical Framework: Resource-Based View

The study is anchored on the Resource-Based View of the firm. Barney (1991) argues that firms can achieve sustained competitive advantage through valuable, rare, difficult-to-imitate and non-substitutable resources. Wernerfelt (1984) similarly emphasises the strategic

significance of firm resources. The theory provides a useful basis for examining supply chain capabilities because performance is not determined solely by the resources a firm owns; it is also influenced by how resources are organised and deployed.

From an RBV perspective, supply chain flexibility can be regarded as an organisational capability that enables the firm to redeploy resources when conditions change. Risk management is also a capability because it reflects routines and managerial processes for identifying and responding to supply chain threats. Technology adoption may provide resources and tools, but the RBV suggests that technology alone may not constitute a sustained advantage if competitors can easily access the same technology.

The theory therefore provides a particularly useful explanation for the expected differences among the three variables. Flexibility and risk management are embedded in organisational routines and managerial practices. Technology, by contrast, may be more easily acquired. Its contribution to performance may depend on complementary capabilities that are more deeply embedded within the firm.

The RBV also helps explain why technology adoption may have a non-significant direct effect. The possession of technology is not equivalent to the capability to use technology strategically. A firm may adopt a digital system, but unless the system is integrated into supply chain routines and supported by human capability, its performance value may remain limited. This theoretical reasoning is consistent with the empirical results of the wider study.

2.6 Empirical Review and Research Gap

The literature on supply chain flexibility, risk management and technology adoption has developed considerably, but the three variables have rarely been examined together in the context of SMEs in South-East Nigeria. Existing research tends to examine flexibility as a component of resilience or focuses on risk management as a separate supply chain discipline. Technology studies often emphasise digital transformation and Industry 4.0, particularly in larger manufacturing settings.

Research on flexibility demonstrates that the capability to adjust supply chain activities can support responsiveness and resilience. Stevenson and Spring (2007) provide a foundational framework for flexibility, while Tiwari et al. (2020) highlight its relevance to SMEs. Kazancoglu et al. (2022) further demonstrate that flexibility and agility are important for resilience during disruption.

Risk management research similarly establishes that the identification and mitigation of supply chain threats can protect operational performance. Manhart et al. (2020) provide a meta-analytic perspective on risk management strategies and firm performance, while Munir et al. (2020) examine the role of supply chain integration in enabling risk management and operational performance. These studies suggest that risk management is not simply a defensive activity.

Technology adoption research, however, presents a more complex picture. Studies have identified positive effects of digital technologies on visibility and supply chain capabilities (Huang et al., 2023; Zhao et al., 2023). Yet technology adoption can also be constrained by skills, resources and organisational readiness. The finding from the wider study that technology adoption did not have a significant direct effect on SME performance provides an important empirical puzzle.

The research gap addressed by this study is therefore both contextual and conceptual. Contextually, there is limited evidence on how these three capabilities influence SME performance in South-East Nigeria. Conceptually, the study brings together adaptation, risk

management and technology adoption in one model. This allows the article to compare the relative performance implications of capabilities that operate through different mechanisms.

The study also addresses a practical gap. SME managers and policymakers often receive broad recommendations to adopt technology as a route to improved performance. The evidence presented here suggests that technology adoption should be considered alongside more fundamental capabilities such as flexibility and risk management. This provides a more nuanced basis for resilience and performance decisions.

3. Methodology

3.1 Research Design and Study Context

The study adopted a quantitative descriptive survey design. The design was appropriate because the research sought to examine the statistical relationships between supply chain flexibility, supply chain risk management, technology adoption and SME performance. The survey approach also enabled the collection of standardised data from SMEs operating across the study area.

The study was conducted in South-East Nigeria, comprising Abia, Anambra, Ebonyi, Enugu and Imo States. SMEs in the region operate across several business sectors and face an operating environment characterised by supply uncertainty, changing customer requirements and resource constraints. This context provides a relevant setting for examining the relationship between resilience-related supply chain capabilities and performance.

3.2 Population, Sample and Sampling Procedure

The population of the wider study was estimated at approximately 150,000 SMEs operating in South-East Nigeria. The estimate was derived from national SME enterprise statistics and the regional distribution of enterprises used in the wider study. Using Taro Yamane's formula at a 5% sampling error, a sample size of 398 SMEs was determined.

A combination of purposive and convenience sampling techniques was adopted. Purposive sampling was used to identify SMEs across geographical locations, business sectors and firm-size considerations, thereby ensuring that the study included relevant categories of SMEs. Convenience sampling was subsequently based on respondents' accessibility and willingness to participate. The use of this non-probability sampling approach reflected the practical difficulty of accessing a geographically dispersed SME population.

A total of 398 questionnaires were distributed. Of these, 325 were returned complete and valid for analysis, representing a usable response rate of 81.7%. The final sample provided a substantial empirical basis for estimating the relationships among supply chain flexibility, risk management, technology adoption and SME performance.

3.3 Instrument and Measurement

Data were collected through a structured questionnaire. The questionnaire included demographic items and measurement statements for the study constructs. Substantive items were measured on a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

Supply chain flexibility was measured using four items capturing the ability of SMEs to adjust supply chain activities, resources and operational arrangements in response to changing conditions. Supply chain risk management was measured using four items relating to the identification, assessment and mitigation of supply chain risks. Supply chain technology adoption was measured using five items reflecting the integration and use of

digital and technological tools in supply chain activities. SME performance was measured using six items reflecting operational and market-related performance outcomes.

The instrument was reviewed by experts in marketing and supply chain management to assess content relevance and clarity. The measurement model was subsequently assessed using factor loadings, composite reliability and average variance extracted. Discriminant validity was assessed using the Fornell-Larcker criterion.

3.4 Data Analysis

Descriptive statistics were used to summarise the characteristics of the respondents and the response patterns for the study variables. Structural equation modelling was used to assess the measurement and structural models. The measurement model was evaluated using factor loadings, composite reliability and average variance extracted. The structural model was used to test the three hypotheses.

The hypotheses were evaluated using the estimated path coefficients and their associated significance levels. A relationship was considered statistically significant where the p-value was below 0.05. Model fit was assessed using established fit indices, including the chi-square to degrees of freedom ratio, comparative fit index, Tucker-Lewis index, goodness-of-fit index, root mean square error of approximation and standardised root mean square residual.

4. Results

4.1 Respondent Profile

The final sample consisted of 325 valid respondents. Respondents aged 25–34 years constituted 36.6% of the sample, while those aged 35–44 years represented 25.2%. Male respondents accounted for 69.0% and female respondents 31.0%. With respect to firm age, 36.0% of the SMEs had operated for 5–10 years, 17.8% for 11–15 years and 15.1% for more than 15 years. Retail businesses represented 48.9% of the sample, followed by e-commerce (20.0%), food and beverages (16.3%) and manufacturing (14.8%).

The profile suggests that the study included a substantial proportion of established SMEs with several years of operating experience. This is relevant because firms with longer operating histories may have accumulated experience in managing supply disruptions and adapting to changing business conditions.

Table 1. Profile of Respondents

Characteristic	Category	Frequency	Percent (%)
Age	Below 25 years	31	9.5
	25–34 years	119	36.6
	35–44 years	82	25.2
	45–54 years	59	18.2
	55 years and above	34	10.5
Gender	Male	224	69.0
	Female	101	31.0
Years in operation	Below 5 years	101	31.1
	5–10 years	117	36.0
	11–15 years	58	17.8
	Above 15 years	49	15.1
Sector	Manufacturing	48	14.8
	Retail	159	48.9
	E-commerce	65	20.0
	Food and beverages	53	16.3

4.2 Descriptive Results

The descriptive results indicate generally positive perceptions of supply chain flexibility. The mean scores for flexibility items ranged from 3.73 to 3.93. Respondents generally agreed that their businesses were able to adjust supply chain activities and respond to changes in operational conditions. However, the presence of undecided responses on some items suggests that flexibility is not equally developed across all SMEs.

Supply chain risk management also recorded favourable responses. The results indicate that respondents generally recognised the importance of identifying, assessing and mitigating supply chain risks. The positive response pattern suggests that risk-related practices are present among the sampled SMEs, although the level of formalisation may vary from firm to firm.

The results for technology adoption were more mixed. While some respondents reported the use of technological tools, the response pattern did not provide evidence of a uniformly strong technology capability across the sample. This is important because technology adoption may be influenced by firm resources, skills and the level of integration of the technology into existing processes.

SME performance indicators generally recorded positive response patterns. Respondents reported favourable perceptions of their operational and market outcomes. The descriptive results therefore provided a suitable basis for examining whether the three supply chain capabilities were statistically related to performance.

4.3 Measurement Model

The measurement model demonstrated acceptable reliability and validity. Factor loadings for the study constructs exceeded the recommended threshold of 0.70. The flexibility loadings ranged from 0.78 to 0.88, while performance loadings ranged from 0.77 to 0.89. The reliability and validity results indicate that the measurement items adequately represented their respective constructs.

Composite reliability values were 0.913 for supply chain flexibility, 0.895 for supply chain risk management, 0.895 for technology adoption and 0.937 for SME performance. The AVE values were 0.724, 0.681, 0.681 and 0.713 respectively. All AVE values exceeded 0.50, indicating acceptable convergent validity.

Discriminant validity was assessed using the Fornell-Larcker criterion. The square root of the AVE for each construct exceeded its correlations with the other constructs. The results confirm that flexibility, risk management, technology adoption and performance were empirically distinct constructs.

Table 2. Measurement Model Summary

Construct	Factor loading range	CR	AVE
Supply chain flexibility	0.78–0.88	0.913	0.724
Supply chain risk management	0.78–0.86	0.895	0.681
Technology adoption	0.78–0.86	0.895	0.681
SME performance	0.77–0.89	0.937	0.713

4.4 Model Fit

The model fit statistics indicated that the hypothesised model provided an acceptable fit to the observed data. The chi-square/degrees of freedom ratio was 1.96. The comparative fit index was 0.96 and the Tucker-Lewis index was 0.95. The RMSEA was 0.05 and the SRMR was 0.04. The GFI was 0.88. Collectively, the fit indices provided sufficient support for evaluating the structural relationships.

Table 3. Model Fit Indices

Fit index	Recommended threshold	Obtained value	Assessment
χ^2/df	≤ 3.00	1.96	Good
CFI	≥ 0.90	0.96	Excellent
TLI	≥ 0.90	0.95	Excellent
GFI	≥ 0.90	0.88	Acceptable
RMSEA	≤ 0.08	0.05	Excellent
SRMR	≤ 0.08	0.04	Acceptable

4.5 Hypothesis Testing

Table 4. Structural Model Results

Hypothesis path	β	S.E.	C.R.	p-value	Decision
Flexibility $\rightarrow$ SME performance	0.30	0.07	4.54	< 0.001	Supported
Risk management $\rightarrow$ SME performance	0.37	0.07	5.68	< 0.001	Supported
Technology adoption $\rightarrow$ SME performance	-0.05	0.07	-0.65	0.52	Not supported

The first hypothesis examined the effect of supply chain flexibility on SME performance. The result was positive and statistically significant ($\beta = 0.30$, $p < 0.001$). H1 was therefore supported. The result indicates that SMEs with stronger flexibility capabilities tend to achieve better performance outcomes.

The second hypothesis tested the effect of supply chain risk management on SME performance. The relationship was positive and statistically significant ($\beta = 0.37$, $p < 0.001$). H2 was supported. Supply chain risk management recorded the strongest path coefficient in the model, suggesting that risk-related capability is particularly important for SME performance.

The third hypothesis examined the effect of supply chain technology adoption on SME performance. The relationship was negative but statistically insignificant ($\beta = -0.05$, $p = 0.52$). H3 was not supported. The result indicates that technology adoption did not have a significant direct effect on performance in the model.

5. Discussion of Findings

5.1 Supply Chain Flexibility and SME Performance

The finding that supply chain flexibility has a significant positive effect on SME performance supports H1. The result indicates that SMEs that can adjust their supply chain activities and resources are better positioned to achieve favourable performance outcomes. In practical terms, flexibility gives firms room to respond when the operating environment changes.

The finding supports Stevenson and Spring (2007), who conceptualise flexibility as the ability to adjust supply chain activities, and Tiwari et al. (2020), who emphasise its relevance to SMEs. It is also consistent with Kazancoglu et al. (2022), who identify flexibility as an important capability for resilient supply chains. The result further agrees with research connecting flexibility to customer responsiveness and performance (Al Azzani & Jusoh, 2024; Jafari et al., 2023).

The result is particularly meaningful in the South-East Nigerian SME context. SMEs may face supplier delays, changing customer needs and fluctuations in the availability of resources. A firm that is unable to adjust may experience a prolonged interruption. A flexible firm, however, may modify purchasing decisions, change operational arrangements or adjust the volume of goods handled.

The finding also reinforces the RBV perspective. Flexibility is not simply a physical resource. It is a capability embedded in routines and managerial practices. Competitors may be able to imitate a particular operational arrangement, but the ability to continuously reconfigure resources may be more difficult to replicate.

The implication is that SMEs should not treat flexibility as an emergency response. Instead, managers should deliberately design supply chain arrangements that permit adjustment. This may include alternative suppliers, adaptable processes and flexible distribution arrangements. The significant relationship between flexibility and performance demonstrates that adaptability is an important performance resource.

5.2 Supply Chain Risk Management and SME Performance

The significant positive effect of supply chain risk management provides support for H2. The coefficient of 0.37 was the strongest in the model. This indicates that risk management may be the most influential of the three capabilities in explaining SME performance within the study context.

The finding is consistent with Manhart et al. (2020), who demonstrate the performance relevance of supply chain risk management strategies, and Munir et al. (2020), who connect risk management with operational performance. It also supports recent discussions that position risk management as a foundation of resilience in disruptive environments (Madzík et al., 2024).

The strong effect of risk management may reflect the nature of the SME environment. When a firm has limited resources, the consequences of an unexpected disruption can be severe. Proactive risk identification may enable managers to recognise vulnerabilities before they become operational crises. Risk management can therefore protect performance by reducing the probability or impact of disruption.

The result also challenges the tendency to view risk management as a purely defensive activity. The evidence suggests that risk management may create value. Firms that assess supplier risks, monitor vulnerabilities and prepare contingency responses may be more stable and better able to serve customers.

From an RBV perspective, risk management represents an organisational capability. The ability to identify and manage supply chain risks is embedded in managerial routines and decision processes. It is therefore not simply a policy document or a risk register. The performance effect observed in this study suggests that SMEs should develop risk management as a regular organisational practice.

The practical implication is clear: SME managers should prioritise risk assessment and mitigation. This may involve identifying critical suppliers, monitoring changes in supply conditions and developing contingency plans. Given that risk management recorded the strongest effect in the model, it should be treated as a strategic performance capability rather than an administrative exercise.

5.3 Technology Adoption and SME Performance

The finding that technology adoption does not have a significant direct effect on SME performance provides the most distinctive result of the study. H3 was not supported because the path coefficient was negative and statistically insignificant ($\beta = -0.05$, $p = 0.52$). The result appears counter-intuitive in an era in which digital transformation is frequently presented as essential for supply chain performance.

The finding does not necessarily mean that technology has no value. Rather, it suggests that technology adoption alone did not produce a direct performance effect in the model. This interpretation is consistent with the argument that technology requires complementary organisational capabilities. Gölzer et al. (2025) emphasise strategic capability and organisational alignment, while Huang et al. (2023) and Zhao et al. (2023) demonstrate that technology can improve supply chain capabilities under appropriate conditions.

Several explanations may account for the finding. First, SMEs may adopt technology in a fragmented manner. A firm may use digital tools without integrating them across supply chain activities. Second, employees may lack the skills required to use technology effectively. Third, the costs associated with technology acquisition and maintenance may offset short-term performance benefits. Finally, the value of technology may be indirect.

The indirect-effect explanation is particularly important. Technology may improve performance by strengthening flexibility or risk management. For example, a digital system may improve information visibility, which enables better risk identification. Similarly, technology may improve forecasting and allow the firm to adjust operations more effectively. If the performance benefit is realised through these capabilities, the direct path from technology adoption to performance may become weak or statistically insignificant.

This interpretation is also consistent with the RBV. Technology can be acquired by many firms and may therefore be relatively imitable. The unique performance advantage may arise not from possessing the technology but from the organisational capability to integrate and use it effectively. The study therefore cautions against treating technology adoption as an automatic performance solution.

The practical implication is not that SMEs should avoid technology. Rather, managers should ensure that technology investments are linked to clear operational needs and supported by staff training, process integration and strategic alignment. Technology should be viewed as an enabler of capabilities rather than a substitute for them.

5.4 Comparative Interpretation of the Three Capabilities

The combined findings provide an important comparative insight. Supply chain risk management recorded the strongest effect on performance, followed by flexibility, while technology adoption did not have a significant direct effect. This pattern suggests that

capabilities embedded in organisational practices may have more immediate performance implications than technology adoption considered in isolation.

Risk management and flexibility are both capability-intensive. They require managers to understand the supply environment, make decisions and develop routines for responding to change. Technology, by contrast, may be more visible and easier to acquire but may not automatically create performance value. The findings therefore challenge a technology-first approach to SME resilience.

The results also suggest that the three variables should not be treated as substitutes. Technology may support risk management and flexibility, even though its direct effect is not significant. The most appropriate interpretation is therefore one of complementarity. SMEs may benefit from technology when it is integrated into risk and adaptation processes.

This comparative finding provides a distinct contribution of the article. The central issue is not whether SMEs should adopt technology, but whether they possess the organisational capabilities required to convert technology into performance. In the context of South-East Nigeria, the evidence suggests that the immediate priority should be strengthening risk management and flexibility while ensuring that technology investments are strategically aligned.

6. Theoretical Implications

The study contributes to the Resource-Based View by demonstrating that the performance implications of supply chain capabilities may differ according to how deeply they are embedded in organisational routines. Flexibility and risk management produced significant positive effects, suggesting that capabilities developed through routines and managerial practices can contribute to performance.

The non-significant effect of technology adoption provides an additional theoretical insight. The finding suggests that technology adoption alone may not satisfy the conditions necessary for competitive advantage. Technology may be accessible to competitors and may not be valuable unless it is integrated with complementary capabilities. This supports a capability-oriented interpretation of the RBV.

The study also contributes to resilience research by isolating three dimensions of supply chain resilience-related capability. Rather than assuming that all resilience dimensions have identical performance effects, the findings demonstrate variation in the strength and significance of their relationships with SME performance.

Finally, the study extends the empirical application of the RBV to SMEs in an emerging economy. The results indicate that SMEs can develop performance-relevant capabilities even when operating with resource constraints. The findings therefore support the argument that competitive advantage may arise from how resources are organised and deployed rather than from resource volume alone.

7. Managerial Implications

The findings provide several implications for SME managers. First, risk management should be treated as a strategic activity. Managers should systematically identify critical supply chain risks, assess their potential impact and develop practical mitigation strategies. This is particularly important because risk management recorded the strongest effect on performance.

Second, SMEs should build flexibility into supply chain operations. Managers should review whether the business can change suppliers, adjust purchasing volumes or modify operational

processes when conditions change. Flexible arrangements should be planned before a disruption occurs.

Third, technology investment should be guided by operational needs. SMEs should avoid adopting technology simply because it is fashionable or widely promoted. Before investing, managers should identify the supply chain problem the technology is intended to solve and assess whether the firm has the skills and processes required to use it effectively.

Fourth, technology should be integrated with risk management and flexibility. For example, digital information systems may be used to monitor supplier risks, while analytical tools may support demand planning and operational adjustment. The evidence suggests that the value of technology may increase when it strengthens other supply chain capabilities.

Fifth, policymakers and SME support agencies should provide capability development alongside technology incentives. Training in supply chain risk assessment, operational planning and digital integration may be as important as providing access to technology itself.

8. Conclusion and Recommendations

This study examined the effects of supply chain flexibility, supply chain risk management and supply chain technology adoption on the performance of SMEs in South-East Nigeria. The findings demonstrate that flexibility and risk management have significant positive effects on SME performance, while technology adoption does not have a significant direct effect.

The study concludes that adaptive and risk-oriented capabilities are central to SME performance in uncertain supply environments. Supply chain risk management emerged as the strongest predictor, suggesting that proactive risk identification and mitigation should receive considerable managerial attention. Flexibility also contributes significantly by enabling SMEs to adjust operations and resources when conditions change.

The non-significant direct effect of technology adoption suggests that digital tools alone do not guarantee improved performance. Technology may require organisational readiness, strategic alignment and integration with other supply chain capabilities before its value becomes evident. The study therefore concludes that technology should be viewed as an enabler of resilience capabilities rather than an automatic substitute for them.

Based on the findings, the study recommends that SME managers should: (1) establish structured supply chain risk assessment and mitigation routines; (2) develop flexible sourcing, operational and distribution arrangements; (3) align technology investments with clearly identified supply chain problems; (4) provide training and organisational support for technology use; and (5) integrate technology with risk management and flexibility initiatives.

The study is subject to limitations. Its cross-sectional design limits the ability to assess how the three capabilities develop over time. The use of non-probability sampling also limits statistical generalisation beyond the study context. Future studies should examine whether technology adoption indirectly influences performance through flexibility or risk management. Longitudinal and mixed-method studies may also provide deeper insight into how SMEs build and use resilience capabilities in practice.

References

- Al Azzani, H. A., & Jusoh, N. M. (2024). Supply chain flexibility and customer responsive: A perspective from SMEs. *Migration Letters*, 21(4), 695–711.
- Alshahrani, M. A., & Salam, M. A. (2022). The role of supply chain resilience on SMEs' performance: The case of an emerging economy. *Logistics*, 6(3), 47.
- Ayeni, A. O., Obafemi, A. A., & Ozeh, H. (2026). Supply chain flexibility and collaboration strategies on performance of fast-food chains in South-South, Nigeria. *European Journal of Innovative Studies and Sustainability*, 2(1), 183–195.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120.
- Brusset, X., & Teller, C. (2017). Supply chain capabilities, risks, and resilience. *International Journal of Production Economics*, 184, 59–68.
- Chiyem, I. R., & Etomi, O. E. (2024). Supply chain management and the performance of small and medium scale enterprises in Nigeria. *International Journal of Management & Entrepreneurship Research*, 6(10), 3399–3414.
- Christopher, M., & Peck, H. (2004). Building the resilient supply chain. *The International Journal of Logistics Management*, 15(2), 1–14.
- Gölzer, P., Kittl, C., & Kerschbaum, F. (2025). Strategic capabilities and technology-enabled supply chain resilience. Reference details as reported in the dissertation.
- Huang, Y., Zhou, X., & Wang, Y. (2023). The impact of Industry 4.0 on supply chain capability and supply chain resilience: A dynamic resource-based view. Reference details as reported in the dissertation.
- Jafari, H., Ghaderi, H., Malik, M., & Bernardes, E. (2023). Supply chain flexibility and customer responsiveness: The role of innovation orientation. Reference details as reported in the dissertation.
- Kazancoglu, I., Ozbiltekin-Pala, M., Mangla, S. K., Kazancoglu, Y., & Jabeen, F. (2022). Role of flexibility, agility and responsiveness for sustainable supply chain resilience during COVID-19. *Journal of Cleaner Production*, 362, 132431.
- Madžík, P., Falát, L., Copuš, L., & Čarnogurský, K. (2024). Resilience in supply chain risk management in disruptive world: Rerouting research directions during and after pandemic. *Annals of Operations Research*.
- Manhart, P., Summers, J. K., & Blackhurst, J. (2020). A meta-analytic review of supply chain risk management: Assessing buffering and bridging strategies and firm performance. *Journal of Supply Chain Management*, 56(3), 66–87.
- Munir, M., Jajja, M. S. S., Chatha, K. A., & Farooq, S. (2020). Supply chain risk management and operational performance: The enabling role of supply chain integration. *International Journal of Production Economics*, 227, 107667.
- Ponomarov, S. Y., & Holcomb, M. C. (2009). Understanding the concept of supply chain resilience. *The International Journal of Logistics Management*, 20(1), 124–143.
- Stevenson, M., & Spring, M. (2007). Flexibility in supply chains: A research framework. *International Journal of Operations & Production Management*, 27(7), 685–713.
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533.

- Tiwari, S., Gupta, H., & Sahoo, S. (2020). Supply chain flexibility in SMEs. *Benchmarking: An International Journal*, 27(4), 1217–1245.
- Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, 5(2), 171–180.
- Wieland, A., & Durach, C. F. (2021). Two perspectives on supply chain resilience. *Journal of Business Logistics*, 42(3), 315–322.
- Zhao, Y., Li, X., & Wang, H. (2023). Digital technologies, visibility and operational flexibility in supply chains. Reference details as reported in the dissertation.