Building Supply Chain Resilience Through Layered Capability Integration: A Dynamic Capabilities Perspective

Parameswaran S[1], Dr Vanathi R[2]

[1]*Research Scholar, Department of Business Management, Erode Arts and Science College (Autonomous), Erode*

[2]*Assistant Professor (SS) and Head, Department of Business Management, Erode Arts and Science College (Autonomous), Erode*

Abstract—**Supply chain disruptions are increasing in frequency and severity, compelling organizations to treat resilience as a strategic capability rather than a reactive response. While prior research identifies multiple antecedents of supply chain resilience, there is limited empirical evidence on how operational and relational capabilities systematically integrate to generate resilience and enhance firm performance. Drawing on the Resource-Based View and Dynamic Capabilities Theory, this study develops and empirically tests a layered capability framework in which resilience emerges as a higher-order dynamic capability through structured integration of logistics, relational, and adaptive capabilities. Using survey data from manufacturing firms and structural equation modeling, the findings reveal that information management capability strengthens cooperation and coordination, which subsequently foster integrated supply chain logistics capability. Integration enhances collaboration and visibility, leading to flexibility and response velocity. These adaptive capabilities significantly contribute to supply chain resilience, which in turn positively influences firm performance. The results highlight coordination and visibility as critical structural drivers in the resilience formation process. By empirically validating a capability-layering mechanism, this study advances resilience theory beyond isolated capability perspectives and offers a comprehensive dynamic capabilities explanation for performance enhancement under disruption. The findings provide actionable insights for managers aiming to build resilient, adaptive, and competitively robust supply chains in turbulent environments.**

Index Terms—**Supply Chain Resilience; Dynamic Capabilities; Logistics Capabilities; Capability Integration; Supply Chain Integration; Response Velocity; Firm Performance.**

I. INTRODUCTION

Global supply chains are operating in an era of unprecedented turbulence. Over the past decade, organizations have faced escalating disruptions arising from geopolitical tensions, trade conflicts, pandemics, natural disasters, and technological shocks. The COVID-19 pandemic, in particular, exposed structural vulnerabilities in globally dispersed, efficiency-driven networks. Subsequent semiconductor shortages, port congestions, and regional conflicts further reinforced the fragility of interconnected supply systems. These developments have shifted managerial focus from cost efficiency toward robustness, adaptability, and long-term survivability. Within this evolving landscape, supply chain resilience has emerged as a central strategic priority.

Supply chain resilience refers to the ability of a supply chain to anticipate, absorb, adapt to, and recover from disruptions while maintaining continuity of operations and performance. Early research emphasized redundancy, risk mitigation, and recovery planning. More recent studies highlight agility, flexibility, visibility, and collaboration as critical enablers. While these insights are valuable, they often treat capabilities as independent predictors rather than as components of an integrated capability system, limiting understanding of how operational and relational capabilities combine to generate resilience outcomes.

This limitation reflects a broader gap in supply chain research. Much of the resilience literature remains descriptive, identifying what capabilities matter without explaining how they interrelate to create adaptive strength. Consequently, resilience is frequently portrayed as an outcome variable without a clear mechanism explaining its formation. Addressing this gap requires a capability-based perspective that captures the layered and integrative nature of organizational adaptation.

The Resource-Based View (RBV) provides a foundational lens for understanding how firm-specific resources and capabilities generate sustained competitive advantage. According to RBV, organizations achieve superior performance by developing valuable, rare, inimitable, and non-substitutable capabilities. However, in volatile environments, static resource ownership is insufficient. Firms must continually reconfigure their resource base to respond to change. Dynamic Capabilities Theory extends RBV by emphasizing the ability to integrate, build, and reconfigure internal and external competencies. From this perspective, resilience can be conceptualized as a higher-order dynamic capability that enables organizations to sense disruptions, seize adaptive opportunities, and transform supply chain configurations.

Despite this theoretical alignment, empirical research rarely models supply chain resilience as an outcome of layered dynamic capabilities. Existing studies often examine constructs such as integration, visibility, collaboration, or flexibility in isolation. While these constructs positively influence resilience or performance, the cumulative and hierarchical relationships among them remain underexplored. In particular, limited empirical evidence explains how foundational logistics capabilities translate into relational alignment, enabling integrated processes and higher-order adaptive capabilities such as flexibility and velocity.

Logistics capabilities, including information and interface management, provide the operational foundation for supply chain functioning. Effective information management ensures timely, accurate, and transparent data exchange across boundaries. However, information sharing alone does not guarantee alignment. Relational capabilities, such as cooperation and coordination, are required to transform information into synchronized action.

Cooperation reflects shared goals and relational commitment among partners, while coordination represents structured alignment of activities, processes, and decisions. These relational mechanisms enable integrated logistics processes that transcend functional and organizational silos.

Integrated logistics capability, in turn, facilitates broader supply chain capabilities, including collaboration and visibility. Collaboration promotes joint planning, shared problem-solving, and adaptive learning across partners. Visibility enhances transparency and real-time awareness of material and information flows. Together, these capabilities foster flexibility—the capacity to adjust structures and processes—and velocity—the speed of response to disruption. These adaptive capabilities directly contribute to resilience.

Conceptualizing resilience through layered capability integration provides a comprehensive explanation of how organizations build adaptive strength. Rather than treating resilience as standalone, this perspective positions it as the culmination of coordinated operational, relational, and adaptive capabilities. Such an approach clarifies theoretical relationships and offers practical guidance for managers prioritizing capability development investments.

This study addresses the identified research gap by developing and empirically testing a layered capability framework grounded in RBV and Dynamic Capabilities Theory. Specifically, it examines how logistics capabilities enhance cooperation and coordination, which in turn enable integrated logistics capability. Integration strengthens collaboration and visibility, fostering flexibility and response velocity. These adaptive capabilities collectively enhance supply chain resilience, ultimately improving firm performance.

The study makes several contributions. It advances resilience theory by conceptualizing resilience as a higher-order dynamic capability emerging from structured capability layering. It clarifies hierarchical relationships among logistics, relational, and adaptive capabilities. It empirically validates the resilience–performance linkage and provides actionable insights for managers to systematically build resilience through coordinated capability development rather than isolated initiatives.

By combining theoretical grounding with empirical validation, this research offers a structured explanation

of resilience formation and its strategic implications, contributing to scholarly and managerial debates on designing supply chains that are efficient, adaptive, and competitively robust in turbulent environments.

II. LITERATURE REVIEW

A. Theoretical Foundation

Understanding how organizations develop resilience in turbulent environments requires a capability-based theoretical lens. The Resource-Based View (RBV) posits that firm-specific resources and capabilities form the basis of sustained competitive advantage when they are valuable, rare, inimitable, and non-substitutable. Within supply chain contexts, capabilities such as coordination mechanisms, information systems, and collaborative routines represent strategic assets that differentiate firms from competitors.

However, RBV has been criticized for its relatively static orientation. In dynamic and uncertain environments, the mere possession of valuable resources does not guarantee sustained advantage. Firms must continuously adapt, reconfigure, and renew their resource base to remain competitive. Dynamic Capabilities Theory extends RBV by emphasizing the firm's ability to integrate, build, and reconfigure internal and external competencies in response to rapidly changing environments. Dynamic capabilities enable organizations to sense environmental shifts, seize opportunities, and transform operational configurations accordingly.

Supply chain resilience aligns closely with the dynamic capabilities perspective. Resilience involves anticipation, absorption, adaptation, and recovery from disruptions—processes that require reconfiguration of supply networks, reallocation of resources, and coordinated responses across organizational boundaries. From this perspective, resilience can be conceptualized as a higher-order dynamic capability emerging from the integration of multiple lower-order capabilities.

Despite this theoretical alignment, much of the resilience literature remains fragmented. Studies often examine individual antecedents—such as flexibility, redundancy, visibility, or collaboration—without fully explaining how these elements accumulate to create adaptive strength. A dynamic capabilities perspective suggests that resilience should not be viewed as an isolated attribute but as the outcome of structured capability layering: foundational operational capabilities enable relational alignment; relational alignment facilitates integration; integration fosters adaptive capabilities; and adaptive capabilities culminate in resilience.

This layered capability logic provides the theoretical foundation for the present study.

B. Logistics Capabilities

Logistics capabilities represent the operational backbone of supply chain management, encompassing processes and routines through which organizations manage material, information, and financial flows across functional and organizational boundaries. Effective logistics capabilities enhance efficiency, reliability, and responsiveness in supply chain operations.

Among logistics capabilities, information management plays a central role. It refers to the ability to collect, process, share, and utilize timely and accurate data across supply chain partners. In complex networks, information asymmetry can lead to inefficiencies, delays, and misaligned decisions. Robust information systems reduce uncertainty by improving transparency and enabling coordinated planning.

Prior research highlights the importance of information capability in facilitating supply chain integration and collaboration. Accurate information exchange supports synchronized production schedules, inventory management, and demand forecasting. However, information sharing alone does not automatically translate into effective coordination. The transformation of information into synchronized action requires relational mechanisms that align goals and responsibilities among partners.

Logistics capabilities therefore provide a foundational operational infrastructure, creating the informational and process-based conditions necessary for deeper relational and integrative capabilities to emerge. In turbulent environments, firms with strong logistics capabilities are better positioned to respond to disruptions because they possess visibility into operations and operational routines required for rapid adjustment.

C. Relational Capabilities

Relational capabilities refer to a firm's ability to develop and maintain cooperative and coordinated relationships with supply chain partners. These capabilities extend beyond transactional exchanges and involve the structured alignment of objectives, responsibilities, and activities.

Cooperation capability reflects shared goals, mutual trust, and commitment among partners. Cooperative relationships facilitate open communication, joint problem-solving, and resource sharing. In disruption contexts, cooperative partners are more likely to provide priority support, share critical information, and engage in collaborative recovery efforts.

Coordination capability, in contrast, represents the structured synchronization of activities, processes, and decisions. While cooperation reflects relational intent, coordination reflects operational execution. Coordination mechanisms include standardized procedures, shared planning systems, aligned performance metrics, and integrated decision-making processes.

The distinction between cooperation and coordination is critical. Cooperative intent without structured coordination may result in goodwill but limited operational effectiveness. Conversely, formal coordination without relational alignment may lead to compliance but reduced adaptability. Effective supply chain functioning requires both relational trust and synchronized execution.

Relational capabilities serve as an intermediary layer between operational logistics routines and broader supply chain integration. They enable firms to translate information flows into coordinated action, reducing fragmentation and enhancing system-wide performance. In disruption scenarios, strong relational capabilities facilitate rapid alignment of response strategies and resource reallocation across partners.

D. Supply Chain Integration

Supply chain integration refers to the extent to which a firm aligns its processes, information systems, and decision-making structures with those of its supply chain partners. Integration can occur internally across functions or externally across organizational boundaries.

Integrated supply chain logistics capability reflects seamless coordination of logistics processes, including procurement, production planning, inventory management, and distribution. Integration reduces process redundancy, minimizes delays, and enhances synchronization across supply chain nodes.

Research consistently demonstrates positive relationships between integration and performance outcomes. Integrated supply chains achieve improved service levels, reduced lead times, and lower operational costs. Beyond efficiency, integration plays a critical role in enhancing adaptive capacity.

Integration creates structural interdependence among partners, enabling shared situational awareness and joint decision-making. When disruptions occur, integrated systems facilitate coordinated response strategies, such as rerouting shipments, adjusting production schedules, or reallocating inventory. Integration therefore provides a structural platform upon which higher-order adaptive capabilities can develop.

Importantly, integration should not be viewed solely as an outcome of collaboration. Rather, it is a structural capability that emerges from aligned operational and relational routines. By connecting logistics processes across organizational boundaries, integration enhances transparency and responsiveness in supply chain operations.

E. Adaptive Capabilities

Adaptive capabilities represent an organization's ability to adjust structures, processes, and strategies in response to environmental changes. Within supply chains, key adaptive capabilities include collaboration, visibility, flexibility, and velocity.

Collaboration involves joint planning, shared decision-making, and cooperative problem-solving among supply chain partners. Collaborative relationships enable firms to pool knowledge, share resources, and develop coordinated responses to disruptions. Collaboration fosters learning and innovation, enhancing adaptability to unforeseen challenges.

Visibility refers to the extent to which supply chain partners have access to accurate, real-time information regarding inventory levels, demand patterns, production status, and transportation flows. High visibility reduces uncertainty and enables proactive disruption management.

Flexibility represents the capacity to adjust production volumes, sourcing strategies, transportation routes, and inventory policies in response to change. Flexible

supply chains can reconfigure operations without excessive cost or delay.

Velocity refers to the speed at which a supply chain can respond to and recover from disruptions. While flexibility emphasizes structural adaptability, velocity emphasizes temporal responsiveness.

Together, these adaptive capabilities enable supply chains to sense disruptions, reconfigure operations, and restore performance. They represent intermediate dynamic capabilities that contribute directly to resilience formation.

F. Supply Chain Resilience

Supply chain resilience has evolved from a risk management concept to a strategic capability perspective. Early definitions emphasized recovery from disruptions, focusing on redundancy and contingency planning. Contemporary perspectives conceptualize resilience as the capacity to anticipate, absorb, adapt, and recover while maintaining performance continuity.

Resilient supply chains demonstrate robustness in the face of shocks and agility in adapting to new conditions. They combine structural preparedness with adaptive responsiveness, making resilience not merely the absence of vulnerability but the presence of adaptive strength.

From a dynamic capabilities perspective, resilience can be viewed as a higher-order capability emerging from the integration of operational, relational, integrative, and adaptive capabilities. Logistics capabilities provide operational transparency; relational capabilities enable alignment; integration ensures structural connectivity; and adaptive capabilities facilitate reconfiguration. The cumulative interaction of these layers produces resilience.

Importantly, resilience contributes to firm performance by protecting service levels, reducing disruption-related losses, and sustaining customer trust. In highly volatile environments, resilient supply chains provide a competitive advantage by ensuring continuity and responsiveness when competitors struggle.

Despite growing scholarly attention, empirical models that explicitly capture the layered formation of resilience remain limited. By synthesizing logistics, relational, integrative, and adaptive capabilities into a structured framework, this study addresses this gap and advances understanding of resilience as a dynamic and cumulative capability.

III. HYPOTHESIS DEVELOPMENT

This study proposes a layered capability framework in which foundational logistics capabilities enable relational alignment, which facilitates supply chain integration, leading to adaptive capabilities that culminate in supply chain resilience and enhanced firm performance. The hypotheses are developed sequentially following this capability hierarchy.

A. Information Management Capability and Relational Capabilities

Information management capability refers to an organization's ability to collect, process, disseminate, and utilize accurate and timely information across supply chain partners. In complex networks, information asymmetry and delayed communication often result in misaligned decisions, inefficiencies, and conflicts. Effective information systems reduce uncertainty and enhance transparency, supporting structured coordination and relational alignment.

From a dynamic capabilities perspective, information capability strengthens sensing and communication routines that underpin collaborative action. Reliable, real-time data on demand forecasts, inventory levels, production schedules, and shipment status enables partners to develop a shared understanding of operational realities, fostering trust and reducing opportunistic behavior.

Cooperation capability reflects relational goodwill, shared objectives, and commitment among partners. Transparent information flows signal openness, encourage cooperative behavior, and enable joint identification of risks and opportunities.

H1: Information management capability positively influences cooperation capability.

Beyond relational goodwill, information capability also facilitates structured coordination. Coordination capability involves the synchronized execution of interdependent tasks through aligned procedures, schedules, and decision rules. Information transparency allows partners to align production plans, transportation schedules, and inventory replenishment decisions.

H2: Information management capability positively influences coordination capability.

B. Relational Capabilities and Integrated Supply Chain Logistics Capability

Relational capabilities—cooperation and coordination—act as intermediary mechanisms that translate information flows into integrated logistics processes.

Cooperation promotes shared vision and mutual commitment. Cooperative partners are more willing to invest in joint planning systems, share sensitive data, and engage in collective decision-making. Such relationships reduce transactional friction, foster long-term alignment, and create favorable conditions for integration.

H3: Cooperation capability positively influences integrated supply chain logistics capability.

Coordination capability directly drives integration by structuring operational synchronization. Standardized procedures, shared planning routines, and aligned performance metrics ensure that logistics processes are interconnected rather than siloed.

H4: Coordination capability positively influences integrated supply chain logistics capability.

C. Integrated Logistics Capability and Adaptive Capabilities

Integrated supply chain logistics capability provides the structural backbone for higher-order adaptive capabilities. Integration enhances process visibility and encourages collaborative interaction among partners.

Collaboration involves joint planning, shared decision-making, and collective problem-solving. Integrated systems enable partners to access common platforms, participate in synchronized planning, and engage in coordinated forecasting and replenishment activities. By reducing information silos and promoting cross-organizational interaction, integration strengthens collaborative routines.

H5: Integrated supply chain logistics capability positively influences collaboration.

Integration also enhances supply chain visibility. Interconnected logistics processes allow real-time access to inventory status, shipment tracking, demand changes, and production progress. Enhanced visibility reduces uncertainty, improves situational awareness, and facilitates early disruption detection.

H6: Integrated supply chain logistics capability positively influences visibility.

D. Adaptive Capabilities and Resilience Formation

Collaboration and visibility contribute to adaptive capabilities—flexibility and velocity—that directly influence resilience.

Collaboration promotes flexibility by enabling partners to redesign processes, adjust sourcing strategies, and modify production schedules collaboratively. Joint problem-solving and mutual support allow structural adjustments without excessive friction, enhancing the supply chain's capacity to reconfigure operations.

H7: Collaboration positively influences flexibility.

Visibility primarily influences response speed. Real-time, accurate information enables early detection of disruptions and rapid initiation of corrective actions. Velocity reflects the speed at which a supply chain responds to and recovers from disruptions.

H8: Visibility positively influences velocity.

Flexibility allows the supply chain to adjust sourcing arrangements, production volumes, and distribution routes during disruptions, thereby absorbing shocks and maintaining continuity.

H9: Flexibility positively influences supply chain resilience.

Velocity ensures timely response, complementing flexibility by minimizing performance loss and recovery time.

H10: Velocity positively influences supply chain resilience.

E. Supply Chain Resilience and Firm Performance

Supply chain resilience is recognized as a strategic capability that safeguards service levels, revenue streams, and customer satisfaction during disruptions. By minimizing downtime and disruption-related costs, resilience contributes directly to financial and operational performance.

From a dynamic capabilities perspective, resilient supply chains enable firms to adapt to environmental volatility while maintaining competitive positioning. Firms with resilient supply chains can capitalize on market opportunities even during periods of disruption.

H11: Supply chain resilience positively influences firm performance.

F. Summary of the Hypothesized Model

The proposed framework conceptualizes supply chain resilience as the outcome of a layered capability

integration process. Information management capability strengthens relational capabilities (cooperation and coordination), which facilitate integrated logistics capability. Integration enhances collaboration and visibility, which foster flexibility and velocity. These adaptive capabilities culminate in supply chain resilience, ultimately driving firm performance.

By modeling these relationships sequentially, this study offers a structured, theoretically grounded explanation of resilience formation, aligned with dynamic capabilities theory.
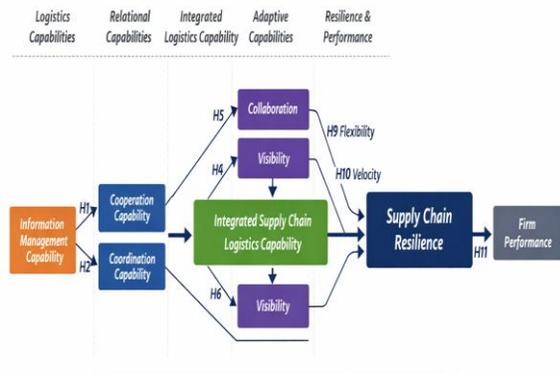

Figure 1. Hypothesized Model of Supply Chain **Resilience** and Firm Performance

IV. RESEARCH METHODOLOGY

A. Research Design

This study uses a quantitative research approach to empirically test the proposed layered capability framework. A survey-based, cross-sectional design was employed, as it allows examination of multiple interrelated constructs and the assessment of both direct and indirect relationships. Given the complexity of the hypothesized model, structural equation modeling (SEM) was chosen as the primary analytical technique.

The study follows a theory-testing approach grounded in the Resource-Based View and Dynamic Capabilities Theory. Constructs and hypothesized relationships were adapted from established supply chain and operations management literature. A structured questionnaire captured respondents' perceptions of organizational capabilities and performance.

B. Instrument Development

The survey instrument was developed in three stages to ensure clarity and validity:

1) Item selection: Measurement items were adapted from prior validated studies on supply chain resilience, logistics capabilities, collaboration, visibility, flexibility, velocity, and performance.
2) Expert review: Supply chain academics reviewed the questionnaire for conceptual alignment and clarity, leading to minor refinements.
3) Pilot testing: A small group of supply chain professionals tested the survey to ensure readability, reduce ambiguity, and confirm completion time.

All items were measured on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

C. Sample and Data Collection

The study targeted manufacturing firms with structured supply chains, where complex upstream and downstream coordination occurs. Respondents were senior managers responsible for supply chain, logistics, procurement, or operations, chosen for their knowledge of processes, partnerships, and performance outcomes.

Data were collected via online and/or physical surveys. Confidentiality and anonymity were assured to encourage honest responses. After screening for completeness, the final dataset met the minimum sample size requirements for SEM. Non-response bias was checked by comparing early and late respondents, with no significant differences found.

D. Measurement of Constructs

All constructs were modeled as reflective latent variables with multiple indicators:

- Information Management Capability: Ability to share accurate and timely information.
- Cooperation Capability: Shared goals, trust, and relational alignment.
- Coordination Capability: Synchronized operational activities and procedures.
- Integrated Supply Chain Logistics Capability: Cross-functional and inter-organizational process alignment.
- Collaboration: Joint planning and collective problem-solving.
- Visibility: Real-time transparency of inventory, production, and shipment information.

- Flexibility: Ability to adjust sourcing, production, and distribution processes.
- Velocity: Speed of response and recovery from disruptions.
- Supply Chain Resilience: Capacity to anticipate, absorb, adapt, and recover while maintaining performance.
- Firm Performance: Comparative indicators of efficiency, service levels, and competitive outcomes.

E. Data Analysis

Structural equation modeling (SEM) was used to test the measurement and structural models. The analysis followed a two-step procedure:

1) Measurement model: Reliability and validity were checked using Cronbach's alpha, composite reliability, factor loadings, and average variance extracted (AVE). Discriminant validity was also verified.
2) Structural model: Hypothesized paths were tested, and explained variance (R^2) and model fit indices were examined. Mediation effects were assessed using bootstrapping to evaluate indirect effects.

F. Addressing Common Method Bias

Potential common method bias from single-source survey data was addressed by:

- Procedural remedies: anonymity assurance, varied question order, and section separation.
- Statistical checks: Harman's single-factor test and a common latent factor approach, which indicated minimal bias.

V. RESULTS AND ANALYSIS

A. Structural Model and Hypothesis Testing

The structural model was estimated using maximum likelihood estimation. Model fit indices remained within acceptable thresholds, indicating that the proposed framework represents the observed data well.

All hypothesized relationships were statistically significant and in the expected direction ($p < 0.05$):

- Information management capability positively influenced cooperation and coordination (H1 & H2).
- Cooperation and coordination positively influenced integrated supply chain logistics capability (H3 & H4).
- Integrated logistics capability positively influenced collaboration and visibility (H5 & H6).
- Collaboration enhanced flexibility, and visibility improved velocity (H7 & H8).
- Flexibility and velocity positively influenced supply chain resilience (H9 & H10).
- Supply chain resilience positively influenced firm performance (H11).

These results support the sequential capability-building process proposed in the conceptual framework.

All eleven hypotheses were supported. Findings validate the proposed layered capability framework, showing that logistics and relational capabilities foster integration, which enables adaptive capabilities, ultimately building supply chain resilience and improving firm performance.

VI. DISCUSSION

A. Interpretation of Findings

The empirical results strongly support the proposed layered capability framework, highlighting how operational, relational, and adaptive capabilities collectively drive supply chain resilience and firm performance.

1) Logistics Capabilities
- Supply management interface capability positively influences demand management, indicating that efficient supply processes improve the firm's ability to meet customer demand.
- Information management capability strengthens supply and demand operations, emphasizing the critical role of timely and accurate information collection, analysis, and dissemination.
- Integrated logistics capabilities enhance collaboration and visibility across supply chain partners, demonstrating the importance of coordinated logistics for overall performance.
- Cooperation vs. coordination: Cooperation primarily improves supply-side operations and integration, while coordination significantly strengthens demand management and overall supply chain alignment.
2) Supply Chain Capabilities

- Collaboration and visibility are essential precursors to adaptive capabilities, confirming their central role in enabling flexibility and velocity.
- Visibility primarily enhances velocity, suggesting that awareness alone is insufficient to achieve operational agility.
- Collaboration positively influences flexibility, but its direct effect on velocity was limited, indicating that rapid response requires additional mechanisms beyond collaborative intent.

3) Supply Chain Resilience and Performance
- Supply chain resilience is significantly shaped by collaboration, visibility, flexibility, and velocity, confirming these capabilities as key antecedents.
- Resilient supply chains demonstrate superior firm performance, validating resilience as a higher-order dynamic capability that enables firms to proactively respond to disruptions and maintain operational excellence.

B. Theoretical Contributions

1) Extends Resource-Based View (RBV) and Dynamic Capabilities Theory by showing how integrated logistics capabilities foster supply chain capabilities, which in turn build resilience.
2) Provides empirical validation of previously conceptualized relationships among logistics capabilities, supply chain capabilities, and resilience.
3) Highlights the interdependence of supply chain capabilities, establishing collaboration and visibility as foundational for flexibility and velocity.
4) Introduces and tests an alternative model for cooperation and coordination capabilities, offering a nuanced understanding of their direct effects on integration and performance.

C. Managerial Implications

1) Capability Development: Managers should strengthen logistics capabilities at both the firm and partner levels to support integrated supply chain capabilities.
2) Information Sharing: Robust information management systems facilitate collaboration, visibility, and coordinated action across supply chain partners.

3) Collaboration and Flexibility: Policies promoting joint decision-making, alternate operating modes, and rapid response mechanisms help mitigate disruptions.
4) Resilience-Oriented Strategy: Building resilience ensures continuity, minimizes disruption impact, and enhances overall supply chain performance.
5) Training and Knowledge Exchange: Conducting partner training on logistics processes, IT systems, and coordination practices improves collective supply chain capability.

VI. CONCLUSION

The primary objective of this study was to examine supply chain resilience at the firm level by investigating its antecedents and performance outcomes through a dynamic capabilities perspective. Drawing on the Resource-Based View and Dynamic Capabilities Theory, this research developed and empirically validated a comprehensive layered capability framework demonstrating how logistics and relational capabilities combine to build supply chain resilience and enhance firm performance.

The findings confirm that resilience does not emerge from isolated capabilities but from the structured integration of multiple interrelated capabilities. Information management, supply and demand interface management, cooperation, coordination, collaboration, visibility, flexibility, and velocity collectively form a sequential capability-building process that culminates in resilience. This layered integration highlights resilience as a higher-order dynamic capability rather than a standalone attribute.

Using survey data and structural equation modeling, the study empirically examined the interrelationships among logistics and supply chain capabilities. A post-hoc analysis explored the roles of cooperation and coordination capabilities, leading to an alternative model after the initially proposed moderating effects were found insignificant. The results consistently demonstrate that supply chain resilience significantly improves firm performance, underscoring its strategic importance in volatile and uncertain environments.

This research contributes to theory by empirically linking logistics capabilities, supply chain capabilities, and resilience within a unified dynamic capabilities framework. It advances understanding of the

mechanism through which resilience develops as a cumulative and hierarchical process.

From a managerial perspective, the findings provide a structured roadmap for building resilience. Managers should prioritize strengthening information systems, relational alignment, integration mechanisms, and adaptive capabilities across the supply chain. By cultivating these interconnected capabilities, firms can enhance responsiveness, minimize disruption impact, and sustain competitive performance.

Finally, by operationalizing and testing the framework within the Indian manufacturing context, this study addresses an important gap in resilience research in emerging markets. The findings offer relevant insights for firms operating in complex and rapidly evolving supply chain environments.

VII. LIMITATIONS

While this study offers important insights into supply chain resilience, several limitations suggest directions for future research.

1) Research Design: This study used a cross-sectional design, capturing data at a single point in time. Consequently, it cannot track how supply chain resilience and capability development evolve over time. Future research could adopt longitudinal designs to examine the dynamics of resilience before, during, and after disruptions.

2) Data Source and Generalizability: The analysis primarily relied on single-respondent data, which may limit reliability. Collecting dyadic or triadic data from multiple supply chain members could provide richer insights into inter-firm interactions. Moreover, the study focused on manufacturing firms in a specific region, and replicating the framework across diverse industries and geographies would enhance generalizability.

3) Measurement Considerations: Some constructs were measured at the first-order level, and certain items were removed during confirmatory factor analysis due to low loadings. Future studies could explore multi-dimensional (second-order) constructs, such as collaboration, and refine measurement items to improve construct validity.

4) Performance Metrics: Firm performance was assessed using perceptual measures. Incorporating objective performance indicators— such as inventory turnover, order fulfillment rates, or service-level metrics—would strengthen empirical rigor.

5) Contextual and Emerging Factors: Environmental turbulence, such as market volatility or disruption severity, was not included as a moderating factor. Future research could examine how such external factors influence the capability–resilience relationship. Additionally, emerging technologies like artificial intelligence, digital supply chain platforms, and advanced analytics are transforming operations. Investigating how these technologies interact with layered capability integration to enhance resilience presents a promising avenue.

Addressing these limitations will provide a deeper understanding of supply chain resilience, improve measurement frameworks, and generate stronger theoretical and practical implications.

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