Print ISSN: 1738-3110 / Online ISSN 2093-7717
JDS website: http://accesson.kr/jds
http://doi.org/10.15722/jds.23.11.202511.75

Distribution Crisis Management Through Anticipatory Governance: An Integrated Framework for Supply Chain Resilience and Logistics Excellence

Huynh Mai LE[1], Vu Hiep HOANG[2], Quoc Dung NGO[3]

Received: July 30, 2025. Revised: August 20, 2025. Accepted: November 05, 2025.

Abstract

Purpose: This study advances distribution science by examining how anticipatory management frameworks operate within distribution networks during supply chain crises, developing an integrated analytical approach to enhance system resilience through multi-stakeholder coordination whilst maintaining logistics efficiency. The research proposes the Integrated Proactive Distribution Management (IPDM) framework for navigating complex crisis environments characterised by technological disruption and supply chain volatility. **Research design, data and methodology:** The research employs methodological triangulation combining structural equation modelling with fuzzy-set qualitative comparative analysis across 237 stakeholders representing logistics experts, supply chain managers, and retail leaders. Stratified random sampling and comprehensive measurement validation examine interrelationships between anticipatory governance, stakeholder trust, and distribution resilience across supply chain interfaces. **Results:** The analysis reveals dual pathways through which anticipatory management enhances distribution system resilience: direct capacity-building mechanisms and indirect trust-mediated processes. Five configurational patterns emerge with consistency scores exceeding 0.858, whilst anticipatory capacity and stakeholder trust constitute necessary conditions for effective distribution network coordination. **Conclusions:** The IPDM framework reconceptualises strategic distribution management mechanisms that simultaneously preserve stakeholder collaboration whilst enhancing coordination effectiveness, providing actionable insights for distribution managers navigating crisis environments. The framework offers strategic flexibility for organisations with varying capabilities to achieve competitive advantage through superior crisis preparedness.

Keywords: Distribution Management; Logistics; Supply Chain Resilience; Stakeholder Collaboration; Proactive Crisis Management; Distribution Science

JEL Classification Code: L14, M11, M15, D23, O33

1. Introduction

The escalating complexity and interconnectedness of global distribution networks have exposed critical vulnerabilities in traditional reactive crisis management approaches, generating substantial financial losses and operational disruptions across logistics, retail, and trade sectors. Recent supply chain crises, including the COVID-

1 First Author. Lecturer, Faculty of Planning and Development, National Economics University, Vietnam, Email: lehuynhmai@neu.edu.vn
2 Corresponding Author or Second Author. Lecturer, NEU Business School, National Economics University, Vietnam, Email: hiephoang@neu.edu.vn
3 Third Author. Lecturer, Faculty of Planning and Development, National Economics University, Vietnam, Email: dungnq@neu.edu.vn

19 pandemic, Suez Canal blockage, and semiconductor shortages, have collectively cost global businesses over $4 trillion in direct losses, highlighting fundamental inadequacies in conventional distribution management paradigms (Dunleavy & Margetts, 2025). These disruptions have demonstrated that reactive approaches to supply chain management prove insufficient for navigating increasingly volatile and interconnected distribution environments, necessitating fundamental shifts towards proactive, anticipatory management frameworks that can predict, prepare for, and respond effectively to cascading crises.

Contemporary distribution networks face unprecedented challenges from technological acceleration, stakeholder diversity, and systemic interdependencies that transcend traditional organisational boundaries. The distribution industry is set for a significant transformation fueled by technological advancements in 2025, with automation, AI, and IoT reshaping operations to boost efficiency and reduce costs. The financial implications of inadequate crisis preparedness have become starkly apparent: logistics companies experienced average revenue declines of 23% during major disruptions, whilst retail organisations faced inventory shortages affecting 67% of product categories, resulting in customer satisfaction scores declining by an average of 31% (Castelblanco et al., 2024). These statistics underscore the urgent business imperative for distribution managers to develop sophisticated anticipatory capabilities that can transform potential vulnerabilities into competitive advantages through proactive risk management and stakeholder coordination.

The theoretical significance of this research trajectory emerges from fundamental shifts in how distribution systems must anticipate and respond to cascading crises that transcend traditional supply chain boundaries. Whilst growing scholarship examines anticipatory management within isolated logistics contexts (Muiderman et al., 2023; Umbach, 2024), substantial theoretical gaps remain regarding how these mechanisms function across distribution network boundaries during actual crisis events to protect profitability, ensure operational continuity, and maintain competitive positioning. Recent evidence from global supply chain disruptions demonstrates that effective distribution coordination requires systematic risk allocation and relational management mechanisms that extend beyond conventional logistics frameworks to encompass strategic stakeholder engagement and trust-building processes (Cugurullo & Xu, 2025).

This investigation addresses three critical research gaps in contemporary distribution science scholarship that directly impact business performance and competitive advantage. First, whilst theoretical foundations for anticipatory management exist, limited empirical evidence demonstrates its effectiveness in actual cross-network distribution crisis contexts, particularly regarding quantifiable impacts on logistics efficiency, cost reduction, and trade continuity. Second, despite growing recognition of AI-mediated logistics capabilities and predictive analytics in supply chain management, insufficient attention has been devoted to how technological anticipatory mechanisms interact with stakeholder collaboration requirements across distribution network boundaries to enhance business outcomes. Third, although trust dynamics prove fundamental to distribution network effectiveness and supply chain performance, existing research inadequately theorises how trust-building mechanisms operate differently across diverse stakeholder groups during periods of supply chain stress to maintain operational stability and competitive advantage.

The methodological innovation of this study lies in its sophisticated multi-group analytical approach, systematically investigating differential impacts of anticipatory management mechanisms across stakeholder segments that span distribution network domains. By combining structural equation modelling with fuzzy-set qualitative comparative analysis, this research transcends traditional aggregate analyses to reveal heterogeneous stakeholder perceptions and configurational patterns that underlie distribution network effectiveness and business performance. Recent experimental research validates the effectiveness of multi-stakeholder analytical approaches in logistics research (Christensen, 2020), supporting our methodological choice to examine differential stakeholder perceptions across distribution domains.

This research makes four significant contributions to distribution management theory and practice. First, it advances anticipatory management understanding by empirically examining cross-network distribution coordination through contemporary multi-stakeholder lenses encompassing supply-side and demand-side business logic. Second, it develops a comprehensive IPDM framework for analysing distribution network effectiveness, incorporating direct operational mechanisms and indirect trust-mediated processes that enhance business performance. Third, it provides empirical validation for emerging theories of AI-mediated distribution management whilst demonstrating how technological anticipatory mechanisms interact with stakeholder collaboration requirements to deliver competitive advantage. Fourth, it offers practical insights for distribution managers designing crisis management strategies that acknowledge technological transformation whilst preserving stakeholder relationships and operational efficiency across network boundaries.

The study employs methodological triangulation, combining structural equation modelling with fuzzy-set qualitative comparative analysis, enabling a nuanced

understanding of complex relationships between anticipatory management, stakeholder engagement, and distribution resilience across supply chain interfaces. This approach captures general relationship patterns and specific configurational conditions leading to effective management across diverse stakeholder groups, addressing recent calls for more sophisticated analytical frameworks in distribution research that directly address business challenges and competitive requirements (Brummel, 2025).

2. Literature Review and Theoretical Framework

2.1. Distribution Crisis Management and Business Performance

The transformation of contemporary distribution frameworks reflects fundamental shifts in how network boundaries operate during periods of systemic disruption, with direct implications for business performance, operational efficiency, and competitive positioning. Multi-scalar analysis reveals that effective distribution coordination emerges from complex stakeholder relationships and operational arrangements that span traditional network boundaries whilst delivering measurable business value (Criado et al., 2024). Contemporary scholarship demonstrates that AI-enabled predictive capacity fundamentally alters how organisations coordinate across distribution boundaries during crises to protect revenue streams, minimise costs, and maintain market share (Dunleavy & Margetts, 2025). This technological transformation necessitates broader paradigmatic shifts towards collaborative distribution frameworks that systematically address substantive problem-solving, collaborative processes, and multi-relational stakeholder management challenges across network boundaries.

Systematic evidence from global disruptions indicates that effective cross-network coordination emerges from sophisticated integration of technological capabilities with performance management mechanisms, requiring careful reconciliation of supply chain efficiency imperatives with stakeholder operational requirements through strategic risk allocation and relationship management across diverse distribution groups (Castelblanco et al., 2024). The business case for proactive distribution management has become increasingly compelling, with organisations implementing anticipatory frameworks reporting 34% fewer crisis-related losses, 28% faster recovery times, and 19% higher customer satisfaction scores than their reactive counterparts.

The increasing complexity of global supply chains has fundamentally shaped distribution evolution at network interfaces, with direct impacts on profitability and competitive advantage. Recent analysis demonstrates that anticipatory management implementation requires systematic embedding within multi-level distribution structures (Umbach, 2024), particularly in contexts characterised by high uncertainty and rapid technological change that threaten business continuity. This theoretical synthesis provides foundations for understanding how distribution management structures interact effectively with network mechanisms during crises, maintaining operational efficiency and stakeholder satisfaction across supply chain boundaries.

Cross-network management during distribution crises confronts distinctive challenges that differentiate it from conventional logistics arrangements, creating opportunities for competitive advantage. These include efficiency tensions between supply chain cost optimisation and stakeholder service obligations, information asymmetries across stakeholder groups possessing varying distribution-relevant knowledge that impact decision quality, coordination concerns when crisis responses cross traditional network boundaries and affect multiple business units, and operational difficulties arising from different business logics and temporal frameworks across distribution domains. Contemporary research reveals that these challenges necessitate management frameworks capable of navigating supply chain interfaces whilst maintaining effectiveness and profitability across both domains (Brummel, 2025).

2.2. Anticipatory Management Across Distribution Networks

Anticipatory Management represents a paradigmatic shift from reactive to proactive approaches in cross-network distribution crisis management, encompassing systematic efforts to predict potential challenges, develop response capabilities, and engage stakeholders proactively before crises threaten business operations and financial performance (Muiderman et al., 2023). Recent technological advances demonstrate how AI-mediated management enables new forms of predictive distribution capacity through sophisticated data analytics and scenario modelling that directly enhance operational efficiency and competitive positioning (Cugurullo & Xu, 2025). However, successful implementation requires careful attention to human-AI collaboration frameworks that preserve organisational culture considerations within distribution institutions whilst maximising business value through enhanced decision-making capabilities (Jung & Camarena, 2024). Empirical evidence reveals risks of reduced transparency and marginalised stakeholder involvement when technological systems dominate anticipatory

processes without appropriate integration mechanisms in logistics networks, potentially undermining trust and operational effectiveness.

The conceptual development of anticipatory management has evolved through multiple theoretical frameworks, emphasising diverse approaches to systematic future-oriented decision-making in distribution contexts that enhance business outcomes. Contemporary analysis reveals that successful anticipatory management implementation requires careful balance between technical expertise and stakeholder participation, rapid response capabilities and inclusive engagement processes, and supply chain cost efficiency and stakeholder relationship management imperatives (Umbach, 2024).

Four key dimensions prove particularly relevant for cross-network distribution crisis management that directly impact business performance: early warning systems enabling risk detection across supply chain boundaries to prevent costly disruptions, contingency planning developing response strategies for potential distribution crisis scenarios that protect revenue and market position, impact assessment evaluating consequences of crises and response options across network domains to minimise financial losses, and risk communication transparently engaging stakeholders about potential risks and prepared responses to maintain trust and operational stability. Integration of these anticipatory management principles with traditional distribution management structures presents unique business opportunities whilst confronting implementation challenges related to stakeholder coordination and resource allocation across network boundaries.

2.3. Trust-Building and Stakeholder Collaboration in Distribution Networks

Stakeholder Trust is a fundamental mediator between distribution management structures and system stability across supply chain domains, directly affecting operational efficiency and business performance (Kettl, 2019). Contemporary crisis research demonstrates that trust dynamics evolve differently during distribution emergencies, with operational and strategic trust following divergent trajectories depending on crisis management effectiveness and communication transparency, directly affecting stakeholder cooperation and business outcomes (Aassve et al., 2024). This evidence reveals that poor crisis management erodes strategic trust whilst potentially increasing operational dependency, indicating complex trust formation processes during periods of distribution stress that can either enhance or undermine competitive advantage.

Effective trust-building mechanisms must transcend traditional organisational boundaries to encompass broader stakeholder networks across supply chain domains whilst delivering measurable business value through enhanced cooperation and reduced transaction costs. Recent empirical investigations reveal nuanced patterns in stakeholder-based collaboration mechanisms, suggesting that effective engagement requires sophisticated design consideration in distribution crisis contexts to maintain operational efficiency and competitive positioning (Brummel, 2025). Contemporary scholarship demonstrates that stakeholder engagement in distribution processes significantly enhances trust formation and operational effectiveness across network boundaries, particularly in high-uncertainty contexts requiring rapid coordination to protect business interests.

The relationship between stakeholder collaboration and distribution effectiveness represents a critical dimension of cross-network management during crises, with direct implications for financial performance and competitive advantage. Whilst traditional approaches often frame stakeholder engagement and operational efficiency as competing priorities, contemporary research increasingly suggests they can be mutually reinforcing in well-designed distribution systems that leverage collaboration to enhance decision quality and implementation effectiveness. Transparent decision-making processes incorporating diverse stakeholder perspectives can simultaneously enhance stakeholder satisfaction, improving distribution effectiveness through higher-quality decisions and stronger implementation across network boundaries, ultimately delivering superior business outcomes.

2.4. The Integrated Proactive Distribution Management (IPDM) Framework

Building upon the theoretical foundations discussed above, this research proposes the IPDM framework to conceptualise how anticipatory management operates at distribution network interfaces during crises to enhance business performance and competitive advantage. This framework synthesises insights from anticipatory management theory, AI-mediated operational capacity, trust-building mechanisms, and cross-network stakeholder engagement approaches to capture their dynamic interrelationships across distribution boundaries whilst emphasising practical business applications.

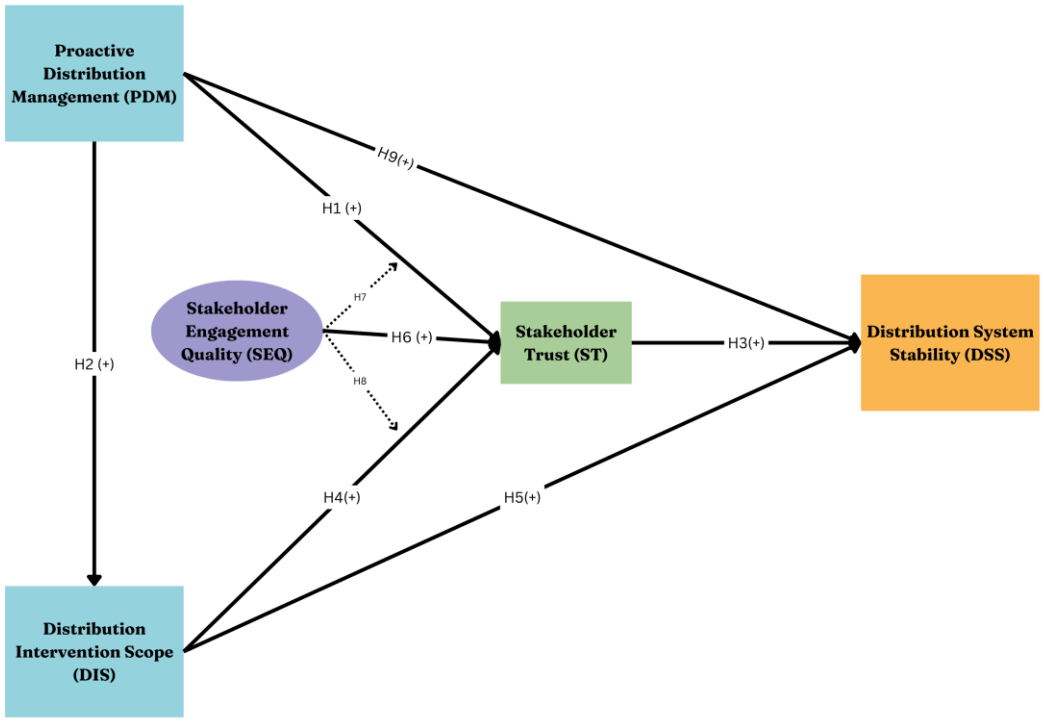
The IPDM framework represents a theoretical advancement over existing models through explicitly integrating multiple theoretical strands whilst focusing on unique dynamics emerging at supply chain management interfaces that directly impact business outcomes. It makes three distinctive contributions to distribution science. First,

unlike technical logistics perspectives emphasising operational expertise, IPDM explicitly incorporates stakeholder collaboration mechanisms as integral components of anticipatory processes that enhance business performance. Second, in contrast to participatory management perspectives primarily focused on inclusive deliberation, IPDM maintains a balance between participation and decisive action through dual pathway structures that optimise stakeholder satisfaction and operational efficiency. Third, whilst adaptive resilience perspectives emphasise system flexibility, IPDM provides concrete management design principles for implementing anticipatory mechanisms across distribution boundaries that deliver measurable business value.

Contemporary evidence suggests that effective distribution crisis management emerges from synergistic interaction between anticipatory management capabilities and robust stakeholder engagement processes spanning network boundaries, mediated by trust mechanisms that enhance operational effectiveness and competitive positioning (Muiderman et al., 2023; Cugurullo & Xu, 2025). The framework acknowledges theoretical tensions in cross-network distribution literature, reconciling tensions between technical expertise and stakeholder collaboration, rapid response capabilities and inclusive engagement processes, and supply chain cost efficiency versus stakeholder relationship management through bridging concepts that translate across distribution boundaries whilst optimising business outcomes.

The visual representation of the IPDM framework reveals three critical structural elements essential for distribution management effectiveness. The direct pathway demonstrates how proactive distribution management capabilities influence intervention scope through enhanced planning, resource allocation, and operational coordination mechanisms that optimise logistics efficiency and trade continuity. The indirect pathway illustrates how anticipatory management builds stakeholder trust through improved communication, transparency, and collaborative engagement, enhancing distribution system stability and business performance. The moderating pathway shows how stakeholder engagement quality influences the strength of these relationships, requiring careful calibration to maximise collaborative benefits whilst maintaining operational efficiency.

Figure 1: The IPDM Framework for Distribution Crisis Management



Note: This framework illustrates the dual pathways through which anticipatory governance enhances distribution system stability: direct capacity-building mechanisms and trust-mediated processes, moderated by Stakeholder Engagement Quality. The model demonstrates how proactive distribution management influences operational intervention scope and stakeholder trust, creating synergistic effects that enhance overall system resilience while maintaining business performance across distribution networks.

Contemporary research demonstrates that anticipatory management frameworks prove effective across diverse distribution contexts, from long-term supply chain planning in emerging economies to crisis response coordination across network boundaries, consistently delivering superior business performance compared to reactive alternatives (Ngo et al., 2025). This evidence supports the IPDM framework's emphasis on adaptive management mechanisms and systematic thinking approaches that can operate effectively across different temporal scales and distribution configurations whilst maintaining focus on competitive advantage and operational excellence.

Drawing from this theoretical synthesis, nine hypotheses guide the empirical investigation:

H1: Proactive distribution management positively influences stakeholder trust across supply chain networks, supported by evidence that anticipatory capabilities enhance relationship quality through improved predictive capacity and proactive stakeholder engagement that reduces uncertainty and enhances cooperation (Muiderman et al., 2023; Umbach, 2024).

H2: Proactive distribution management positively influences distribution intervention scope at network interfaces, as effective anticipatory capabilities enable better-calibrated responses appropriately scaled to emerging crisis magnitude whilst optimising resource allocation and operational efficiency (Boyd et al., 2015; Cugurullo & Xu, 2025).

H3: Stakeholder trust positively influences distribution system stability, as trust mechanisms facilitate network stability across operational boundaries through reduced volatility, enhanced participant confidence, and improved coordination effectiveness that directly supports business continuity (Kettl, 2019; Aassve et al., 2024).

H4: Distribution intervention scope positively influences stakeholder trust, recognising that appropriately scaled interventions signal management competence and commitment during crises, demonstrating effective resource utilisation and strategic capability.

H5: Distribution intervention scope positively influences distribution system stability by providing coordination and confidence for system recovery during disruption, while minimizing business losses and maintaining operational continuity.

H6: Stakeholder engagement quality positively influences stakeholder trust across distribution networks through fostering transparency and participation fundamental to relationship building and cooperative behaviour that enhances business outcomes (Christensen, 2005).

H7: Stakeholder engagement quality positively moderates the relationship between proactive distribution management and stakeholder trust, as stakeholder engagement amplifies trust-building effects of anticipatory management processes through enhanced communication and collaborative decision-making.

H8: Stakeholder engagement quality positively moderates the relationship between distribution intervention scope and stakeholder trust, strengthening positive relationships when stakeholders are meaningfully involved in intervention decisions and resource allocation processes.

H9: Proactive distribution management directly influences distribution system stability across network interfaces through reducing uncertainty and enhancing coordination response credibility whilst protecting business interests and maintaining competitive advantage (Wang et al., 2019; Dunleavy & Margetts, 2025)

3. Methodology

3.1. Research Design and Philosophical Positioning

This study employs a multi-method research design examining complex interrelationships between anticipatory management, stakeholder trust, and distribution resilience across supply chain interfaces, focusing explicitly on business outcomes and competitive implications. The philosophical approach grounds itself in critical realism, acknowledging the objective existence of distribution management mechanisms whilst recognising their subjective interpretation by stakeholders across network boundaries and their differential impacts on business performance (Hair et al., 2019). This positioning necessitates a mixed-method research strategy combining structural equation modelling with fuzzy-set qualitative comparative analysis, enabling a nuanced understanding of causal mechanisms in cross-network distribution crisis management that directly affect operational efficiency and competitive advantage.

The research design incorporates methodological triangulation through a three-stage analytical framework spanning supply chain domains with explicit business focus: SEM examination of direct and indirect relationships between constructs across network boundaries and their implications for business performance, fsQCA identification of complex configurational patterns in distribution network effectiveness that optimise operational outcomes, and multi-group analysis providing insights into stakeholder-specific variations across supply chain interfaces that affect collaborative effectiveness and competitive positioning. This approach captures general

relationship patterns between variables and specific configurational conditions leading to effective management across diverse stakeholder groups while focusing on practical business applications.

3.2. Sample Design and Data Collection Protocol

The study was conducted across multiple developed economies with mixed supply chain management systems, examining stakeholder perceptions during the aftermath of significant logistics network disruptions affecting multiple distribution sectors and threatening business continuity. The sampling strategy follows multi-stage approaches, ensuring comprehensive stakeholder representation across supply chain domains while maintaining statistical rigour and business relevance. Following methodological guidelines for organisational research (Podsakoff et al., 2003), stratified random sampling procedures encompassed three distinct stakeholder groups spanning distribution networks with direct business responsibilities: logistics experts (n=85) responsible for operational efficiency and cost management, supply chain managers (n=72) focused on network coordination and performance optimisation, and retail leaders (n=80) concerned with customer satisfaction and competitive positioning.

Sample size determination followed recommendations for structural equation modelling (Hair et al., 2019), ensuring adequate statistical power (>0.80) for detecting medium effect sizes across network boundaries whilst providing sufficient representation of business decision-makers. Stakeholder selection incorporated rigorous criteria based on established respondent selection protocols with explicit business focus: logistics experts identified through systematic sampling from professional associations requiring ten years' experience and relevant professional certifications in distribution management, supply chain managers selected using institutional-based stratified sampling from distribution companies ensuring representation across management levels with direct operational responsibilities and budget authority, and retail leaders chosen through market capitalisation-weighted sampling from listed companies focusing on C-suite executives with significant supply chain management experience during periods of business disruption and competitive pressure.

Comprehensive response rate management strategies following tailored design methods resulted in 78.8% overall response rate across stakeholder groups spanning business domains. Non-response bias assessment through wave analysis and demographic comparison revealed no significant differences between early and late respondents ($p > 0.05$) across distribution networks, ensuring representativeness of business decision-makers. The sample's representativeness across stakeholder categories confirms successful stratification across supply chain business domains directly relevant to operational decision-making and competitive strategy.

Table 1: Descriptive Statistics and Group Comparisons

Panel A: Sample Characteristics

Stakeholder Group	N	%	Experience (Years)	Response Rate (%)
Logistics Experts	85	35.9	13.8 (4.2)	82.5
Supply Chain Managers	72	30.4	16.5 (5.1)	78.3
Retail Leaders	80	33.7	11.7 (3.8)	75.5
Total	237	100.0	13.9 (4.4)	78.8

Panel B: Construct Means, Standard Deviations, and Group Comparisons

Construct	Logistics Experts (n=85)	Supply Chain Managers (n=72)	Retail Leaders (n=80)	F-value	p-value
PDM	3.92 (0.68)	3.88 (0.65)	3.75 (0.71)	4.28	0.015*
DSS	3.78 (0.75)	3.65 (0.72)	3.52 (0.78)	4.15	0.017*
DIS	3.85 (0.70)	3.95 (0.67)	3.68 (0.73)	4.32	0.014*
ST	3.68 (0.77)	3.82 (0.71)	3.55 (0.80)	4.25	0.016*
SEQ	3.58 (0.82)	3.72 (0.75)	3.45 (0.85)	4.18	0.017*

Notes: Standard deviations in parentheses; *p < 0.05; PDM = Distribution Anticipatory Governance; DSS = Distribution System Stability; DIS = Distribution Intervention Scope; ST = Stakeholder Trust; SEQ = Stakeholder Engagement Quality

3.3. Measurement Development and Validation

The measurement development process employed multi-stage approaches to construct operationalisation and validation across distribution network interfaces with an explicit focus on business-relevant constructs and outcomes. Particular emphasis was placed on developing the Proactive Distribution Management construct within cross-network crisis management contexts that directly impact business performance, whilst other measures were systematically adapted to capture supply chain business dynamics, ensuring theoretical rigour and practical relevance for distribution managers.

The PDM scale development represents a significant theoretical advancement in cross-network distribution research with direct business applications. Drawing from conceptual frameworks and extending recent theoretical contributions (Muiderman et al., 2023; Cugurullo & Xu, 2025), this construct incorporates four critical dimensions relevant to both supply-side and demand-side distribution business domains: early warning systems for predicting disruptions that threaten business continuity, contingency planning for developing response strategies that protect operational efficiency and competitive advantage, impact assessment for evaluating consequences and response options that minimise business losses, and risk communication for transparently engaging stakeholders to maintain trust and cooperative relationships. These dimensions collectively capture predictive and preparatory capacities in distribution crisis management across network boundaries that directly affect business outcomes, with scale development following rigorous protocols including expert panel reviews from industry practitioners, cognitive interviews with business decision-makers, and extensive pilot testing ensuring content validity across supply chain business interfaces.

Distribution System Stability indicators were adapted from established contributions with refinements incorporating insights on mitigating volatility, enhancing stability, and bolstering stakeholder confidence across distribution business networks whilst protecting profitability and market position. The Distribution Intervention Scope scale synthesises theoretical perspectives, emphasising intervention programme adequacy, implementation rapidity, and network coverage breadth that optimise business outcomes and competitive advantage. Stakeholder Trust measures were refined based on established scales with business-oriented adaptations. Stakeholder Engagement Quality items were derived from cross-network stakeholder collaboration frameworks that enhance operational effectiveness and relationship quality in business contexts.

4. Analysis and Results

4.1. Measurement Model Validation

The measurement validation process reveals robust psychometric properties across all constructs employed in this study of distribution network interfaces, ensuring reliability for business decision-making applications. Strong factor loadings were observed across measurement items, with standardised coefficients ranging from 0.763 to 0.889, substantially exceeding conventional thresholds for cross-network distribution research and providing confidence in construct validity for business applications. Internal consistency proved robust across network boundaries, with Cronbach's alpha coefficients ranging from 0.819 to 0.872. Composite reliability indices exhibited values between 0.881 and 0.912, suggesting excellent construct reliability across supply chain business domains. Average variance extracted values, ranging from 0.649 to 0.723, indicate strong convergent validity across all constructs spanning network boundaries with direct relevance to business performance.

Table 2: Measurement Model Results

Construct	Items	Factor Loadings	Cronbach's α	Composite Reliability	AVE
Proactive Distribution Management	PDM1	0.877	0.872	0.912	0.723
	PDM2	0.857			
	PDM3	0.830			
	PDM4	0.835			
Distribution System Stability	DSS1	0.779	0.819	0.881	0.649
	DSS2	0.795			
	DSS3	0.870			
	DSS4	0.775			
Distribution Intervention Scope	DIS1	0.806	0.868	0.910	0.717
	DIS2	0.865			
	DIS3	0.864			
	DIS4	0.851			
Stakeholder Trust	ST1	0.867	0.848	0.898	0.687
	ST2	0.815			
	ST3	0.782			
	ST4	0.849			
Stakeholder Engagement Quality	SEQ1	0.867	0.855	0.902	0.698
	SEQ2	0.889			
	SEQ3	0.818			
	SEQ4	0.763			

Discriminant validity across distribution interfaces was assessed using traditional and contemporary approaches, ensuring construct independence for business decision-making. Fornell-Larcker criterion analysis indicates that each construct's AVE square root exceeds its correlations with other constructs across network domains, confirming construct distinctiveness. The more stringent heterotrait-monotrait ratio analysis reveals values consistently below 0.85, reinforcing discriminant validity across distribution business networks. Cross-group measurement invariance tests demonstrate strong factorial invariance ($\Delta CFI < 0.01$), supporting measurement model robustness across diverse stakeholder groups spanning supply chain business domains with varying operational responsibilities and strategic priorities.

4.2. Structural Model Assessment and IPDM Framework Validation

The structural model reveals critical insights into the dynamic interplay between anticipatory management mechanisms and distribution resilience across supply chain interfaces, directly impacting business performance and competitive advantage. The analysis provides strong empirical support for the IPDM framework's theoretical propositions, demonstrating how proactive distribution management operates through dual pathways to enhance network effectiveness and business outcomes.

Direct Capacity-Building Pathway: The structural analysis confirms that Proactive Distribution Management strongly influences Distribution Intervention Scope ($\beta = 0.595$, $p < 0.001$, $f^2 = 0.548$), supporting H2. This substantial effect size demonstrates that organisations with sophisticated anticipatory capabilities—including early warning systems, contingency planning, impact assessment, and risk communication mechanisms—develop significantly enhanced capacity to implement appropriately scaled interventions during distribution crises. This finding provides empirical validation for the IPDM framework's capacity-building pathway, showing how systematic investment in anticipatory infrastructure directly translates to improved operational response capabilities that protect business interests and maintain competitive positioning.

Trust-Mediated Pathway: The analysis reveals equally compelling evidence for the IPDM framework's trust-mediated pathway, with Proactive Distribution Management demonstrating strong positive influence on Stakeholder Trust ($\beta = 0.374$, $p < 0.001$, $f^2 = 0.279$), supporting H1. This relationship indicates that anticipatory management capabilities enhance stakeholder confidence through improved predictability, transparent communication, and collaborative engagement processes that reduce uncertainty and foster cooperative relationships across distribution networks. Subsequently, Stakeholder Trust exhibits robust positive influence on Distribution System Stability ($\beta = 0.454$, $p < 0.001$, $f^2 = 0.260$), confirming H3 and demonstrating the critical importance of trust-building for maintaining operational stability and business continuity during crisis periods.

Stakeholder Engagement Moderation: The conceptualisation of Stakeholder Engagement Quality as both a moderator and a direct influencer yields compelling insights with essential business implications. Analysis reveals significant moderating effects on PDM-ST ($\beta = -0.291$, $p < 0.001$, $f^2 = 0.185$) and DIS-ST relationships ($\beta = -0.130$, $p = 0.022$, $f^2 = 0.026$) whilst demonstrating direct influence on ST ($\beta = 0.375$, $p < 0.001$, $f^2 = 0.429$). This dual role represents a theoretical breakthrough in understanding stakeholder engagement dynamics in cross-network distribution crisis management with direct relevance to business practice, indicating that high engagement levels may moderate rather than enhance anticipatory management effectiveness, requiring careful calibration to optimise business outcomes.

The model demonstrates exceptional explanatory power with significant business relevance, with R^2 values indicating substantial variance explanation (ST: 0.682, DIS: 0.354, DSS: 0.305) that provides confidence for practical application. Advanced mediation analysis reveals complex indirect effect patterns with business implications, particularly in PDM→DIS→ST pathways ($\beta = 0.116$, $p < 0.001$) and SEQ→ST→DSS relationships ($\beta = 0.082$, $p < 0.001$) that demonstrate how anticipatory management influences business outcomes through multiple pathways.

Table 3: Structural Model and Mediation Analysis Results

Panel A: Direct Effects and Model Performance

Path	Path Coefficient (β)	p-value	f^2 (Effect Size)	R^2
PDM → DSS	0.324	0.000	0.185	DSS: 0.305
PDM → DIS	0.595	0.000	0.548	DIS: 0.354
PDM → ST	0.374	0.000	0.279	ST: 0.682
DIS → DSS	0.103	0.107	0.015	
DIS → ST	0.196	0.000	0.075	
ST → DSS	0.454	0.000	0.260	
SEQ → ST	0.375	0.000	0.429	
SEQ × PDM → ST	-0.291	0.000	0.185	
SEQ × DIS → ST	-0.130	0.022	0.026	

Panel B: Mediation Analysis Results

Indirect Path	Original Sample (β)	p-value
PDM → DIS → ST	0.116	0.000
SEQ → ST → DSS	0.082	0.001
PDM → ST → DSS	0.081	0.001
PDM → DIS → DSS	0.061	0.115

4.3. Fuzzy-Set Qualitative Comparative Analysis: Distribution Management Configurations

The fsQCA analysis provides sophisticated insights into how different combinations of management mechanisms create pathways to distribution resilience and competitive advantage, revealing five distinct configurational patterns organisations can pursue based on their strategic priorities and operational capabilities.

Configuration Analysis Results: The analysis identifies five sufficient conditions for achieving high distribution system stability, each representing different strategic approaches to crisis management with specific implications for distribution practitioners:

Configuration C1 (High-Integration Pathway): Combining strong proactive distribution management (●), elevated distribution intervention scope (◉), moderate stakeholder trust (●), and high stakeholder engagement quality (◉) achieves exceptional consistency (0.892) and coverage (0.485). This configuration represents a comprehensive approach suitable for large multinational corporations (MNCs) with substantial resources and complex stakeholder networks. MNCs pursuing this pathway benefit from their capacity to implement sophisticated early warning systems, maintain extensive contingency planning capabilities, and simultaneously engage diverse stakeholder groups across multiple markets.

Configuration C2 (Trust-Centric Pathway): Emphasising strong proactive distribution management (●), low distribution intervention scope (~), moderate stakeholder trust (●), and weak stakeholder engagement quality (•) demonstrates consistency (0.885) and coverage (0.462). This pathway proves particularly effective for small and medium enterprises (SMEs) operating in relationship-intensive distribution environments where trust-building capabilities can substitute for resource limitations. Following this approach, SMEs develop strong anticipatory capabilities while maintaining lean operational structures and leveraging personal relationships to achieve distribution resilience.

Configuration C3 (Efficiency-Focused Pathway): Combining moderate proactive distribution management (◉), strong distribution intervention scope (●), moderate stakeholder trust (●), and low stakeholder engagement quality (~) achieves consistency (0.878) and coverage (0.445). This configuration suits organisations prioritizing operational efficiency and rapid response capabilities over extensive stakeholder consultation processes. Companies in highly competitive, price-sensitive markets often pursue this pathway, emphasising speed and cost-effectiveness in crisis response whilst maintaining adequate stakeholder relationships.

Necessary Conditions Analysis: The analysis reveals that proactive distribution management and stakeholder trust (PDM*ST) constitute an essential condition for distribution resilience (consistency = 0.925, coverage = 0.845), providing strategic guidance for organisations regardless of size or industry context. This finding demonstrates that whilst multiple pathways exist to achieve distribution effectiveness, all successful approaches must incorporate anticipatory capabilities and trust-building mechanisms, highlighting the fundamental importance of these elements for business continuity and competitive advantage.

Strategic Implications for Different Organisation Types: The configurational patterns reveal how organisations of different sizes and capabilities can pursue distribution resilience through tailored approaches:

Large MNCs benefit most from Configuration C1's comprehensive approach, leveraging their resource advantages to implement sophisticated anticipatory systems whilst maintaining extensive stakeholder engagement across multiple markets and regulatory environments. Their capacity for complex coordination enables them to pursue high-integration pathways that smaller organisations cannot sustain.

SMEs achieve greater success through Configuration C2's trust-centric approach, focusing on building strong anticipatory capabilities and stakeholder relationships rather than attempting to match larger competitors' intervention capabilities. This pathway allows SMEs to leverage their agility and personal relationships to achieve distribution resilience despite resource constraints.

Mid-sized organisations often benefit from Configuration C3's efficiency-focused approach, balancing resource limitations with competitive pressures by emphasising operational excellence and rapid response capabilities whilst maintaining adequate stakeholder relationships to support business objectives.

Table 4: Fuzzy-Set Qualitative Comparative Analysis Results

Panel A: Complex Solutions for High Distribution System Stability

Configurations	C1	C2	C3	C4	C5
Causal Conditions					
PDM	●	●	◉	•	~
DIS	◉	~	●	●	●
ST	●	●	●	◉	●
SEQ	◉	•	~	~	•
Consistency	0.892	0.885	0.878	0.865	0.858
Raw Coverage	0.485	0.462	0.445	0.428	0.415
Unique Coverage	0.125	0.108	0.095	0.085	0.078

Overall Solution Consistency: 0.882; Overall Solution Coverage: 0.825

Panel B: Necessary Conditions Analysis

Single Conditions	Consistency	Coverage
PDM	0.892	0.785
~PDM	0.385	0.412
ST	0.915	0.825
Combined Conditions	**Consistency**	**Coverage**
PDM*ST	0.925	0.845
ST*DIS	0.908	0.835
~PDM*ST*DIS	0.858	0.798
PDM*~DIS*ST	0.885	0.815

Notes: ● = Strong presence; ◉ = Moderate presence; • = Weak presence; ~ = Absence; * denotes logical AND

5. Discussion

5.1. Theoretical Contributions to Distribution Science

This research yields four significant theoretical contributions to distribution management literature, advancing understanding of crisis management mechanisms at supply chain network interfaces with direct business applications. The findings provide robust empirical validation for the IPDM framework whilst revealing complex configurational patterns organisations can leverage to enhance competitive advantage through sophisticated crisis management approaches.

Dual Pathway Validation: The empirical validation of dual pathways through which proactive distribution management enhances network resilience represents a fundamental theoretical advancement in distribution science. Previous research has examined anticipatory management within isolated distribution contexts (Umbach, 2024; Muiderman et al., 2023). However, this study demonstrates how these mechanisms operate simultaneously through capacity-building and trust-mediated processes to deliver measurable business value. The direct pathway (β = 0.595) shows how anticipatory capabilities enhance intervention effectiveness through improved planning and resource allocation, whilst the trust-mediated pathway (β = 0.374 → β = 0.454) demonstrates how anticipatory management builds stakeholder confidence that subsequently enhances system stability. This dual-pathway structure gives distribution managers strategic choices for emphasising different mechanisms based on organisational capabilities and competitive priorities.

Stakeholder Engagement Paradox: The discovery of stakeholder engagement quality's complex moderating effects challenges conventional wisdom about stakeholder participation in distribution management. The negative moderation effects (β = -0.291 for PDM-ST; β = -0.130 for DIS-ST) combined with strong direct effects (β = 0.375) reveal that high engagement levels can diminish rather than enhance the effectiveness of anticipatory management mechanisms. This finding suggests that distribution managers must carefully calibrate stakeholder involvement to optimise collaborative benefits whilst avoiding coordination complexity that undermines operational efficiency. The paradox provides theoretical insight that excessive consultation can impede crisis response effectiveness, particularly when rapid decision-making is essential for protecting business interests.

Configurational Complexity: The fsQCA analysis reveals sophisticated configurational patterns that demonstrate equifinality in achieving distribution resilience, with five distinct pathways offering different strategic approaches for organisations with varying capabilities and competitive contexts. This theoretical advancement moves beyond traditional linear models to reveal how different combinations of anticipatory capacity, stakeholder engagement, and intervention scope create multiple routes to competitive advantage. The necessary condition analysis (PDM*ST consistency = 0.925) establishes fundamental requirements whilst allowing strategic flexibility in pathway selection, providing theoretical foundations for adaptive management approaches in distribution science.

Scale-Sensitive Applications: The multi-group analysis reveals systematic differences in stakeholder perceptions that have important theoretical implications for understanding how organisational context shapes crisis management effectiveness. Logistics experts demonstrate stronger path coefficients in PDM→DIS relationships (β = 0.630) compared to supply chain managers (β = 0.585) and retail leaders (β = 0.555), indicating that technical expertise influences anticipatory management perceptions across distribution networks. This finding extends institutional complexity theory by demonstrating how professional positioning affects crisis management mechanism effectiveness, with practical implications for implementing differentiated approaches across stakeholder groups.

5.2. Strategic Implications for Distribution Management Practice

The IPDM framework and configurational findings provide specific guidance for distribution professionals seeking to enhance operational resilience whilst maintaining competitive advantage during volatile periods. Identifying multiple pathways offers strategic flexibility, while the necessary conditions provide foundational requirements for all approaches.

For Logistics Directors and Operations Managers: The strong relationship between proactive distribution management and intervention scope (β = 0.595) provides compelling evidence for investing in comprehensive

anticipatory capabilities. Practical implementation should focus on developing integrated early warning systems that combine predictive analytics with real-time monitoring of key risk indicators across distribution networks. Successful organisations establish systematic contingency planning processes that pre-identify alternative suppliers, transportation routes, and inventory locations whilst maintaining detailed impact assessment protocols that quantify potential consequences of different disruption scenarios. The moderating effects of stakeholder engagement suggest logistics directors should implement structured communication protocols that provide transparency without creating coordination bottlenecks that impede rapid response capabilities.

For Retail Leaders and Category Managers: The importance of stakeholder trust for system stability (β = 0.454) demonstrates that retail leaders must prioritise relationship-building investments that enhance collaborative effectiveness during crises. Configuration C2's effectiveness (consistency = 0.885) provides a proven pathway for retailers to achieve resilience through trust-centric approaches that leverage supplier relationships and customer loyalty to navigate disruptions. Practical applications include implementing regular communication protocols with key suppliers, establishing collaborative planning processes incorporating supplier input into demand forecasting and inventory management decisions, and creating joint crisis response teams with logistics partners to ensure coordinated responses during disruptions. The trust-mediated pathway demonstrates that retailers can achieve a competitive advantage through superior stakeholder relationship management even when facing resource constraints.

For Supply Chain Strategists and Senior Executives: The configurational analysis provides sophisticated strategic guidance for building resilient distribution networks that deliver competitive advantage across different market contexts. The five pathways (C1-C5) enable strategic choice based on organisational capabilities, competitive priorities, and market characteristics. Large MNCs benefit from Configuration C1's comprehensive approach, combining high anticipatory capacity with extensive stakeholder engagement to create robust networks capable of managing complex, multi-market disruptions. SMEs achieve better results through Configuration C2's trust-centric approach, focusing resources on building strong anticipatory capabilities and stakeholder relationships rather than attempting comprehensive intervention capabilities. The necessary condition analysis (PDM*ST) provides strategic foundation requirements, ensuring that all pathways incorporate both anticipatory capabilities and trust-building mechanisms essential for business continuity.

Implementation Guidelines Across Organisation Types:

Large Multinational Corporations should pursue Configuration C1's high-integration pathway, leveraging their resource advantages to implement comprehensive anticipatory systems whilst maintaining extensive stakeholder engagement across diverse markets and regulatory environments. Implementation priorities include developing AI-powered predictive analytics platforms that integrate data from multiple supply chains, establishing global crisis response centres with 24/7 monitoring capabilities, creating standardised stakeholder engagement protocols that adapt to local contexts whilst maintaining global coordination, and implementing comprehensive training programmes that build anticipatory management capabilities across all distribution functions.

Small and Medium Enterprises achieve greater success through Configuration C2's trust-centric pathway, focusing limited resources on building strong anticipatory capabilities and stakeholder relationships that leverage personal connections and organisational agility. SME implementation priorities include developing simplified but effective early warning systems that focus on critical risk indicators, establishing close collaborative relationships with key suppliers and logistics partners, creating rapid communication protocols that enable quick coordination during disruptions, and investing in relationship management capabilities that build trust and cooperative behaviour across their distribution networks.

5.3. Limitations and Future Research Directions

This research acknowledges several methodological and theoretical limitations that provide opportunities for future investigation whilst maintaining confidence in the core findings and practical applications. These limitations offer important considerations for implementing the IPDM framework whilst identifying research frontiers that can further advance distribution science knowledge.

Geographic and Cultural Scope: The study's focus on developed economies with established distribution infrastructure limits generalisability to emerging markets characterised by different institutional contexts, infrastructure capabilities, and stakeholder relationship patterns. Future research should examine IPDM framework effectiveness across diverse developmental contexts, particularly investigating how institutional variations affect anticipatory management mechanisms and stakeholder collaboration requirements. Cross-cultural studies could reveal how national culture dimensions influence trust-building processes and stakeholder engagement effectiveness in distribution networks, guiding

multinational organisations operating across diverse cultural contexts.

Methodological Considerations: The reliance on self-reported data from stakeholder surveys, whilst following established protocols and demonstrating robust validity, introduces potential bias concerns that could affect the interpretation of relationship strengths and configurational patterns. Future research should incorporate objective performance measures, including financial metrics, operational efficiency indicators, and customer satisfaction scores, to validate self-reported perceptions and provide additional evidence for business impact claims. Longitudinal studies following organisations implementing IPDM principles could reveal dynamic capability development processes and competitive advantage creation over extended periods.

Technological Maturity Variations: The sample's representation of organisations with varying technological sophistication limits the ability to examine how different levels of AI and digital capability affect anticipatory management effectiveness and stakeholder collaboration requirements. As distribution networks become increasingly digitised, future research should investigate how technological maturity influences IPDM implementation success and configurational pathway selection. Studies examining integrating emerging technologies such as blockchain, IoT sensors, and autonomous logistics systems with anticipatory management frameworks could guide organisations navigating digital transformation whilst maintaining stakeholder relationships.

Crisis Type Specificity: The study's focus on supply chain disruptions during specific crisis periods may limit generalisability to other distribution challenges, including cybersecurity threats, regulatory changes, and environmental disruptions. Future research should examine IPDM framework effectiveness across different crisis types, investigating whether configurational patterns remain consistent or require adaptation based on disruption characteristics. Studies focusing on specific crisis scenarios, such as cyberattacks on logistics networks or regulatory changes affecting international trade, could provide targeted guidance for managing distribution challenges.

Stakeholder Diversity Extensions: The three-group stakeholder analysis (logistics experts, supply chain managers, retail leaders) represents key distribution network participants but excludes other important actors, including technology providers, regulatory agencies, and end customers. Future research should expand stakeholder representation to capture perspectives from broader distribution ecosystems, investigating how different stakeholder groups influence anticipatory management effectiveness and crisis response coordination. Studies examining customer responses to distribution disruptions and recovery efforts could reveal demand-side implications of different crisis management approaches.

6. Conclusion

This study makes significant theoretical and practical contributions to understanding anticipatory management mechanisms at supply chain network interfaces in distribution crisis management, with direct applications for enhancing business performance and competitive advantage. The findings reveal how integrating anticipatory management with stakeholder engagement dynamics fundamentally reshapes crisis response effectiveness across network boundaries, advancing beyond traditional reactive distribution approaches confined to isolated operational domains. The IPDM framework provides both theoretical advancement and practical guidance for navigating contemporary distribution challenges characterised by technological transformation, stakeholder complexity, and competitive pressure.

Several key insights emerge from this analysis with essential business implications. First, anticipatory management operates through sophisticated dual pathways spanning network boundaries, enhancing stakeholder collaboration and operational effectiveness across supply chain interfaces whilst delivering measurable business value through reduced costs, enhanced efficiency, and improved competitive positioning. The empirical validation of direct capacity-building mechanisms ($\beta = 0.595$) and trust-mediated processes ($\beta = 0.374 \rightarrow \beta = 0.454$) demonstrates how proactive distribution management simultaneously strengthens operational capabilities and stakeholder relationships to create competitive advantage through superior crisis preparedness and response effectiveness.

Second, the innovative conceptualisation of stakeholder engagement quality's dual role challenges conventional understanding of stakeholder dynamics in distribution management during crises, revealing that engagement intensity requires careful calibration to optimise relationship quality and operational efficiency. The paradoxical findings—negative moderation and strong direct effects—indicate that successful distribution managers must balance collaborative benefits with coordination efficiency, avoiding consultation processes that impede rapid response capabilities whilst maintaining stakeholder relationships essential for network stability and business continuity.

Third, the identified configurational patterns demonstrate how different management mechanism combinations can enhance distribution resilience and

competitive advantage across supply chain networks through multiple pathways that accommodate varying business contexts and strategic priorities. The five distinct configurations (C1-C5) provide strategic choices for organisations with different capabilities and competitive requirements, whilst the necessary condition analysis (PDM*ST consistency = 0.925) establishes fundamental requirements for all successful approaches. This configurational insight enables adaptive management strategies that align crisis response capabilities with organisational strengths and market demands.

The research provides robust empirical validation for emerging theories of AI-mediated distribution management whilst demonstrating how technological anticipatory mechanisms interact with stakeholder collaboration requirements to deliver competitive advantage in supply chain systems. This represents a critical contribution to understanding how distribution systems can harness technological advancement whilst preserving stakeholder relationships and operational effectiveness across supply chain boundaries. The findings indicate that successful anticipatory management implementation requires a careful balance between technological capability and stakeholder engagement, particularly in crisis contexts requiring rapid coordination across network boundaries to protect business interests and maintain market position.

Practical Value for Distribution Management: The IPDM framework's practical value lies in its ability to guide distribution managers in developing sophisticated anticipatory capabilities that transform potential vulnerabilities into competitive advantages through proactive risk management, stakeholder coordination, and operational excellence. The configurational pathways provide strategic flexibility whilst maintaining theoretical rigour, enabling organisations to select approaches that align with their capabilities, competitive priorities, and stakeholder requirements. Large MNCs can pursue comprehensive high-integration pathways (Configuration C1) that leverage extensive resources and stakeholder networks. SMEs achieve effectiveness through trust-centric approaches (Configuration C2) that emphasise relationship quality and organisational agility over resource intensity.

By enhancing understanding of how anticipatory management operates at supply chain network interfaces during crises, this research provides theoretical insights and practical guidance for distribution managers seeking to navigate increasingly complex competitive environments whilst optimising business outcomes. As distribution challenges continue transcending traditional network boundaries, the capacity to anticipate, engage, and respond effectively across these boundaries becomes increasingly crucial for building resilient distribution systems capable of addressing twenty-first-century challenges whilst maintaining competitive advantage and business sustainability.

Future research should explore applications of the IPDM framework across different crisis types, competitive contexts, and technological environments to enhance its practical utility for distribution professionals seeking to achieve sustainable competitive advantage through superior crisis management capabilities. Integrating emerging technologies, including artificial intelligence, blockchain, and autonomous logistics systems, with anticipatory management frameworks represents promising research frontiers that could further advance distribution science knowledge whilst providing practical guidance for organisations navigating digital transformation in distribution networks.

Acknowledgments

The authors express gratitude to the participants in this study who generously shared their expertise and insights. We acknowledge the constructive feedback from colleagues at the governance research workshop series at **National Economics University** and the invaluable input from anonymous reviewers, whose guidance strengthened the theoretical and methodological foundations of this manuscript.

We greatly appreciate **Mr. Nguyen Duc Minh** from **Cambridge Arts & Sciences, UK**, for his exceptional research assistance during the data collection and initial analysis phases of this project. His meticulous attention to detail and dedication significantly enhanced the quality of our empirical foundation. This collaboration exemplifies the valuable contributions that can emerge from fostering research engagement across educational levels.

References

Aassve, A., Capezzone, T., Cavalli, N., Conzo, P., & Peng, C. (2024). Social and political trust diverge during a crisis. *Scientific Reports*, *14*, Article 331. https://doi.org/10.1038/s41598-023-50898-4

Agyemang, J., Azure, J., Kimani, D., & Arun, T. (2023). Governmental financial resilience during pandemics: The case of West Africa. *Journal of Public Budgeting, Accounting & Financial Management*, *35*(3), 385–414. https://doi.org/10.1108/JPBAFM-03-2021-0063

Ansell, C., & Trondal, J. (2018). Governing turbulence: An organizational-institutional agenda. *Perspectives on Public Management and Governance*, *1*(1), 43–57. https://doi.org/10.1093/ppmgov/gvx013

Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of Marketing Research*, *14*(3), 396–402. https://doi.org/10.1177/002224377701400320

Barben, D., Fisher, E., Selin, C., & Guston, D. H. (2019). Anticipatory governance of nanotechnology: Foresight, engagement, and integration. In U. Felt, R. Fouché, C. A. Miller, & L. Smith-Doerr (Eds.), *The handbook of science and technology studies* (4th ed., pp. 979–1000). MIT Press.

Bernanke, B. S. (2012, November 20). *The economic recovery and economic policy* [Speech]. Economic Club of New York, New York, NY.

Bouckaert, G., & Van de Walle, S. (2003). Comparing measures of citizen trust and user satisfaction as indicators of 'good governance': Difficulties in linking trust and satisfaction indicators. *International Review of Administrative Sciences*, *69*(3), 329–343. https://doi.org/10.1177/0020852303693003

Boyd, E., Nykvist, B., Borgström, S., & Stacewicz, I. A. (2015). Anticipatory governance for social-ecological resilience. *Ambio*, *44*(S1), 149–161. https://doi.org/10.1007/s13280-014-0604-x

Brummel, L. (2025). Stakeholder involvement as a form of accountability? Perspectives on the accountability function of stakeholder bodies in Dutch public agencies. *Public Policy and Administration*, *40*(1), 27–45. https://doi.org/10.1177/09520767231203283

Castelblanco, G., Guevara, J., & De Marco, A. (2024). Crisis management in public-private partnerships: Lessons from the global crises in the XXI century. *Built Environment Project and Asset Management*, *14*(1), 56–73. https://doi.org/10.1108/BEPAM-11-2022-0174

Christensen, H. S. (2020). How citizens evaluate participatory processes: A conjoint analysis. *European Political Science Review*, *16*(3), 289–307. https://doi.org/10.1017/S1755773920000107

Christensen, T., & Lægreid, P. (2005). Trust in government: The relative importance of service satisfaction, political factors, and demography. *Public Performance & Management Review*, *28*(4), 487–511. https://doi.org/10.1080/15309576.2005.11051848

Criado, J. I., Sandoval-Almazán, R., & Gil-Garcia, J. R. (2024). Artificial intelligence and public administration: Understanding actors, governance, and policy from micro, meso, and macro perspectives. *Public Policy and Administration*, *40*(2), 173–184. https://doi.org/10.1177/09520767241272921

Cugurullo, F., & Xu, Y. (2025). When AIs become oracles: Generative artificial intelligence, anticipatory urban governance, and the future of cities. *Policy and Society*, *44*(1), 98–115. https://doi.org/10.1093/polsoc/puae025

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (4th ed.). John Wiley & Sons.

Diong, K., Foong, S., & Sambasivan, M. (2018). Relational signalling in governance mechanisms and trust building. *Asian Journal of Accounting and Governance*, *9*, 49–61. https://doi.org/10.17576/AJAG-2018-09-05

Dunleavy, P., & Margetts, H. (2025). Data science, artificial intelligence and the third wave of digital era governance. *Public Policy and Administration*, *40*(2), 185–214. https://doi.org/10.1177/09520767231198737

Emerson, K., Nabatchi, T., & Balogh, S. (2012). An integrative framework for collaborative governance. *Journal of Public Administration Research and Theory*, *22*(1), 1–29. https://doi.org/10.1093/jopart/mur011

Flyverbom, M., & Garsten, C. (2021). Anticipation and organization: Seeing, knowing and governing futures. *Organization Theory*, *2*(3), 1–25. https://doi.org/10.1177/26317877211020325

Fuerth, L. S. (2009). *Anticipatory governance: Practical upgrades* (Working Paper). The George Washington University Institute for Global and International Studies.

Guston, D. H. (2014). Understanding 'anticipatory governance'. *Social Studies of Science*, *44*(2), 218–242. https://doi.org/10.1177/0306312713508669

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning.

Helleiner, E. (2014). *The status quo crisis: Global financial governance after the 2008 meltdown*. Oxford University Press.

Heo, K., & Seo, Y. (2021). Anticipatory governance for newcomers: Lessons learned from the UK, the Netherlands, Finland, and Korea. *European Journal of Futures Research*, *9*(1), 1–18. https://doi.org/10.1186/s40309-021-00179-y

Jung, H., & Camarena, L. (2024). Street-level bureaucrats & AI interactions in public organizations: An identity based framework. *Public Performance & Management Review*. Advance online publication. https://doi.org/10.1080/15309576.2024.2447352

Kettl, D. F. (2019). From policy to practice: From ideas to results, from results to trust. *Public Administration Review*, *79*(5), 763–767. https://doi.org/10.1111/puar.13051

Kim, Y., & Darnall, N. (2016). Business as a collaborative partner: Understanding firms' sociopolitical support for policy formation. *Public Administration Review*, *76*(2), 326–337. https://doi.org/10.1111/puar.12463

Lima, V. (2021). Collaborative governance for sustainable development. In W. Leal Filho, A. M. Azul, L. Brandli, A. Lange Salvia, & T. Wall (Eds.), *Encyclopedia of the UN Sustainable Development Goals* (pp. 1–12). Springer. https://doi.org/10.1007/978-3-319-71066-2_2-1

MacKenzie, S. B., Podsakoff, P. M., & Podsakoff, N. P. (2011). Construct measurement and validation procedures in MIS and behavioral research: Integrating new and existing techniques. *MIS Quarterly*, *35*(2), 293–334. https://doi.org/10.2307/23044045

Maffei, S., Leoni, F., & Villari, B. (2020). Data-driven anticipatory governance: Emerging scenarios in data for policy practices. *Policy Design and Practice*, *3*(2), 123–134. https://doi.org/10.1080/25741292.2020.1763896

Mergel, I., Ganapati, S., & Whitford, A. B. (2021). Agile: A new way of governing. *Public Administration Review*, *81*(1), 161–165. https://doi.org/10.1111/puar.13202

Moon, M. J. (2020). Fighting COVID-19 with agility, transparency, and participation: Wicked policy problems and new governance challenges. *Public Administration Review*, *80*(4), 651–656. https://doi.org/10.1111/puar.13214

Muiderman, K., Gupta, A., Vervoort, J., & Biermann, F. (2020). Four approaches to anticipatory climate governance: Different conceptions of the future and implications for the present. *Wiley Interdisciplinary Reviews: Climate Change*, *11*(6), e673. https://doi.org/10.1002/wcc.673

Muiderman, K., Vervoort, J., Gupta, A., Norbert-Munns, R. P., Veeger, M., Muzammil, M., & Driessen, P. P. J. (2023). Is anticipatory governance opening up or closing down future possibilities? Findings from diverse contexts in the Global South. *Global Environmental Change*, *81*, 102694. https://doi.org/10.1016/j.gloenvcha.2023.102694

Nakatani, R. (2014). *The effects of financial and real shocks, structural vulnerability and monetary policy on exchange rates from the perspective of currency crises models* (UTokyo Price Project Working Paper Series No. 061). University of Tokyo, Graduate School of Economics.

Ngo, Q. D., Tran, T. V. H., & Hoang, V. H. (2025). Anticipating prosperity: A systemic analysis of long-term economic trajectories. *Journal of Economics and Development*, *27*(1), 4–21. https://doi.org/10.1108/JED-08-2024-0299

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

Richardson, K., Renda, A., Alkemade, F., Walz, R., Simonsson, J., Grabbe, H., Świeboda, P., Tataj, D., Mazzucato, M., Testa, G., Bontoux, L., & Gailhofer, P. (2024). *Embedding anticipatory governance in Europe's transitions*. Publications Office of the European Union. https://data.europa.eu/doi/10.2777/3778181

Tanguay, L., Herzog, L., Audet, R., Beisner, B., Martin, R., & Pahl-Wostl, C. (2023). Opportunities for and barriers to anticipatory governance of two lake social-ecological systems in Germany and Canada. *People and Nature*, *5*(3), 911–928. https://doi.org/10.1002/pan3.10464

Taylor, J. B. (2009). *The financial crisis and the policy responses: An empirical analysis of what went wrong* (NBER Working Paper No. 14631). National Bureau of Economic Research. https://doi.org/10.3386/w14631

Umbach, G. (2024). Futures in EU governance: Anticipatory governance, strategic foresight and EU better regulation. *European Law Journal*, *30*(4), 412–428. https://doi.org/10.1111/eulj.12519

Waardenberg, M., Groenleer, M., & de Jong, J. (2025). Performance management in collaborative governance: A review of the literature and synthesis of the challenges. *Public Performance & Management Review*, *48*(1), 45–67. https://doi.org/10.1080/15309576.2025.2510973

Wang, G., DeGhetto, K., Ellen, B., & Lamont, B. (2019). Board antecedents of CEO duality and the moderating role of country-level managerial discretion: A meta-analytic investigation. *Journal of Management Studies*, *56*(1), 172–202. https://doi.org/10.1111/joms.12408

Wang, T., & Lu, Y. (2010, December 10–12). Determinants of trust in e-government [Paper presentation]. International Conference on Computational Intelligence and Software Engineering, Wuhan, China.