Coping Strategies for Supply Chain Disruption Risks and Pathways to Enhance Resilience: A Case Study of CATL

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Abstract. This study investigates the underlying causes of response failures in supply chain disruption management, despite the widespread adoption of formal contingency plans by manufacturing enterprises. Through a comparative case analysis of Contemporary Amperex Technology Co. Limited (CATL) and LG Electronics, we identify two critical dimensions contributing to such failures: external structural dependencies and internal coordination barriers. CATL's vulnerability stems from deep reliance on upstream critical raw materials, illustrating that supplier diversification alone cannot eliminate structural fragility when control over key resources is lacking. In contrast, LG Electronics faces challenges rooted in insufficient multi-tier supplier visibility and inefficient logistics integration. Both cases further reveal significant internal coordination barriers, including delayed information flows and rigid cross-functional decision-making, which hinder dynamic response during disruptions. Grounded in information processing theory, this study emphasizes that resilience depends not only on structural design but also on organizational agility. We propose a shift from "diversified layout" to "critical control" in structural strategy and stress the need to break "dynamic response barriers" through enhanced information architectures and collaborative mechanisms. Our findings offer actionable pathways for enterprises to bridge the gap between static contingency planning and dynamic response execution.

Keywords: Supply Chain Resilience, Disruption Management, Structural Dependency, Internal Coordination, Contingency Plan Failure, Dynamic Response.

1. Introduction

Against the backdrop of escalating uncertainty across global supply chains, disruption risks have emerged as a critical operational challenge for enterprises. The resilience demonstrated by corporate supply chains—encompassing resistance, adaptation, and recovery capabilities—directly determines their viability and competitive positioning in the market. Despite the pre-establishment of comprehensive risk contingency systems by numerous enterprises, actual disruption events frequently reveal delayed responses and implementation lags. This indicates that pre-designed emergency plans and recovery strategies often fail to be effectively activated or executed when confronted with actual supply chain disruptions [1].

This discrepancy exposes potential underlying deficiencies in enterprise supply chain management. To investigate the root causes of this issue, this study selects Contemporary Amperex Technology Co. Limited (CATL) as a primary research subject, focusing specifically on why advanced manufacturing enterprises with well-developed contingency plans still encounter challenges in response activation. Grounded in established theoretical frameworks and employing case study and comparative analysis methodologies, this research systematically examines CATL's response strategies and resilience performance during supply chain disruptions, drawing on its annual reports from 2019 to 2024 and relevant academic literature.

To enhance the generalizability and differentiation of findings, this study additionally incorporates publicly available data from LG Electronics as a supplementary case. Through analyzing both external supply chain structures and internal organizational coordination mechanisms, we explore common challenges and differentiated responses exhibited by manufacturing enterprises when facing disruptions. By conducting qualitative analysis and cross-case comparison, this research aims to reveal the underlying causes of contingency plan failures and propose actionable pathways for resilience enhancement.

2. Literature Review

2.1. Supply Chain Resilience

Supply chain resilience primarily refers to the capacity of a supply chain to recover to its normal operational state, or even achieve an improved state, after being subjected to market risk disruptions [2,3]. More specifically, it encompasses the ability to withstand shocks, adapt to changes, and rapidly restore normal operations4].

At the external structural level, resilience materializes through strategically engineered network architectures that incorporate deliberate redundancy and operational flexibility. These structural elements include supplier diversification to mitigate single-source dependencies, strategic inventory positioning to buffer against demand fluctuations, and multi-modal transportation networks to maintain material flow during localized disruptions. Such configurations enable organizations to both passively resist initial disruption impacts through built-in buffer capacities and proactively adapt to evolving crisis conditions through reconfigurable network relationships. The structural dimension essentially creates the physical and relational infrastructure that allows disruption impacts to be absorbed and distributed across the network rather than concentrating at critical failure points.

Regarding internal coordination, resilience emphasizes the development of sophisticated information processing capabilities and streamlined decision-making architectures. This entails establishing integrated data systems that provide end-to-end supply chain visibility, creating cross-functional crisis response teams with clearly defined authority boundaries, and implementing dynamic resource allocation protocols that can be rapidly activated during disruptions. These coordination mechanisms enable organizations to detect emerging threats more quickly, interpret complex disruption scenarios more accurately, and execute coordinated response actions more effectively. The integration of robust external structures with agile internal coordination creates a synergistic effect where physical network capabilities are amplified through informational and decisional agility, while coordinated responses are grounded in structurally feasible implementation pathways [4].

Therefore, a highly resilient supply chain fundamentally embodies the seamless integration of a structurally robust external network architecture with a dynamically responsive internal coordination mechanism. This integrated approach ensures that organizations possess not only the physical capacity to withstand disruptions but also the organizational capability to learn from disruptive experiences and enhance their competitive position. The ultimate manifestation of supply chain resilience lies in building systems that not only withstand the impact of disruptions but also transform them into opportunities for strategic breakthroughs and operational optimization.

2.2. Supply Chain Disruption

The fundamental objective of supply chain resilience is to establish comprehensive organizational capabilities that either prevent the occurrence of supply chain disruptions entirely or, when such events become inevitable, systematically mitigate their negative operational and financial impacts to the greatest extent possible. Supply chain disruption conceptually refers to situations where internal or external sudden events—including natural disasters, geopolitical conflicts, supplier bankruptcies, or technological system failures—cause significant stagnation or complete breakdown in the synchronized flow of materials, information, or financial capital within integrated supply networks, thereby severely impairing normal business operations and strategic performance [5]. In recent years, such disruption events have become increasingly prevalent and severe across global supply networks, driven by intensifying climate-related incidents, escalating geopolitical tensions, and heightened interconnectivity within complex global production systems, creating an operational environment characterized by unprecedented volatility and uncertainty.

Contemporary management of these disruptions typically follows a comprehensive, phased approach spanning the entire disruption lifecycle. During the event prevention phase, enterprises implement proactive structural strategies—such as strategic supplier diversification, multi-channel

sourcing of critical components, maintaining strategic inventory buffers, and developing alternative logistics channels—to systematically enhance the supply chain's inherent resilience against potential disruptions. These preventative measures aim to build structural robustness, achieving the goal of either completely avoiding disruptions or significantly mitigating their potential severity through carefully designed network redundancy and flexibility.

During the incident phase, when preventive measures still fail to avert disruptions, supply chain resilience primarily manifests as dynamic adaptability. This critical capability enables organizations to execute rapid operational adjustments—including production resource reallocation, dynamic freight route adjustments, temporary process changes, and contingency procurement plans—thereby effectively absorbing the initial shock and preventing disruptions from further propagating through the supply network. This adaptive function embodies the supply chain's dynamic responsiveness in sustaining core operations amid turbulent environments.

Finally, in the post-event recovery phase, pre-established emergency coordination mechanisms, well-developed collaborative partnerships, and clearly defined communication protocols facilitate accelerated restoration of normal supply chain operations. This systematic recovery approach significantly shortens the disruption duration, minimizes associated financial and operational losses, and crucially incorporates organizational learning mechanisms that translate disruption experiences into enhanced future resilience through updated contingency plans and refined response procedures. This comprehensive phased framework—encompassing prevention, adaptation, and recovery—enables organizations to not only withstand disruptions but potentially emerge with strengthened competitive positioning and improved operational capabilities.

3. Analysis

Despite widespread awareness among manufacturing enterprises regarding proactive risk assessment and the establishment of systematic supply chain contingency systems, recent disruption events reveal a significant gap between preemptive evaluation and post-disruption response. This paper contends that this response failure phenomenon primarily stems from challenges across two dimensions.

3.1. External Structural Dependencies

First, enterprises' efforts to diversify suppliers often prove insufficient to overcome dependencies on critical raw materials in practice, leading to compromised resistance capabilities during crucial moments.

Analysis indicates that CATL's supply chain resistance is constrained by its deep reliance on upstream critical raw materials. This conclusion is supported by both theoretical and empirical evidence. Theoretically, Researchers identify supplier diversification as a fundamental strategy for risk dispersion and enhanced supply chain resistance [4]. However, the reality for CATL's power battery industry reveals that premium production capacity for core raw materials remains highly concentrated, creating deep dependencies on a limited number of critical suppliers. CATL's 2024 annual report explicitly acknowledges significant impacts on key materials including cathode materials and separators due to upstream chemical raw materials such as lithium, cobalt, and nickel. Although CATL's annual reports from 2023 to 2024 show a decrease in the proportion of total annual procurement from its top five suppliers from 20.26% to 16.33%, indicating conscious efforts to optimize supplier structure and enhance supply chain resilience, the structural vulnerability inherent in these dependencies remains undeniable. Insufficient control over key nodal resources constitutes a fundamental structural weakness in enterprise supply chains. When external shocks occur, this source-level vulnerability directly undermines the resistance capacity of midstream and downstream networks.

In contrast, LG Electronics faces a different manifestation of structural challenges. Its core issue lies not in insufficient control over raw materials, but rather in inadequate monitoring of multi-tier

suppliers and structural inefficiencies in downstream logistics networks [6]. This presents a striking contrast to CATL: LG's vulnerability primarily originates from the "middle" (transparency and monitoring) and "end" (logistics) segments of its supply chain, reflecting deficiencies in visibility and control within complex networks.

3.2. Internal Coordination Barriers

In addition to structural risks within the external supply chain, the failure of internal organizational response mechanisms constitutes a critical factor contributing to the breakdown of contingency plans.

At the level of internal coordination, CATL's case reveals profound obstacles in the execution of preparedness strategies. Although the company has not publicly disclosed specific disruption response protocols, its annual report data provides indirect empirical support for this theoretical proposition. Data from its 2019-2024 financial reports indicates a conspicuous peak in consigned processing materials during 2021-2022. This pattern may be interpreted as an indirect indicator of insufficient internal coordination efficiency during supply chain disruptions. When information transmission delays and decision-making lag occur among procurement, production, and sales departments, internal production planning fails to rapidly align with external demand fluctuations. The resulting delays in order adjustments consequently compel enterprises to increase emergency outsourcing to maintain operational continuity.

This observation aligns with the findings of Nikookar and his team, who emphasize that supply chain responsiveness and interdepartmental collaboration serve as necessary prerequisites for achieving supply chain resilience [7]. Their research theoretically substantiates that without efficient internal coordination; the implementation of any technical contingency plan becomes fundamentally compromised. Therefore, even with comprehensively developed supply chain risk contingency plans, enterprises that fail to effectively address internal information flow barriers and decision-making delays—thereby achieving efficient coordination and information transmission—will inevitably experience response failures when confronting dynamic crises.

Simultaneously, the case of LG Electronics provides more concrete evidence of such internal coordination barriers. Documented issues including "information asymmetry and absence of unified platforms," coupled with "rigid functional segmentation and insufficient cross-departmental collaboration," have been identified as direct internal causes for its "delayed response capacity" [8]. Collectively, these two cases demonstrate that implicit internal organizational barriers represent a common challenge constraining adaptive and restorative capabilities within supply chains across enterprise contexts.

4. Discussion

4.1. Rethinking Structural Resilience: From "Diversified Layout" to "Critical Control"

The case analysis of CATL demonstrates that building structural resilience in supply chains requires moving beyond superficial supplier diversification. While there is research that correctly identified supplier diversification as a fundamental strategy for enhancing resistance capabilities [4], CATL's experience reveals that diversification limited to midstream and downstream suppliers fails to address dependencies on upstream critical resources, resulting in fragile and incomplete resilience construction. This finding substantiates assertion that resilience building must consider the entire supply chain network's architecture [9]. Consequently, enterprises' pre-event risk assessment must extend throughout upstream and downstream operations, shifting focus from pursuing supplier quantity to establishing control over critical suppliers and key resources.

The LG Electronics case reveals that structural vulnerability in supply chains can originate from multiple sources. Their situation demonstrates that structural risks emerge not only from dependencies on critical physical resources but equally from deficiencies in information flow and process control. This comparative analysis deepens our understanding of supply chain structural resilience: for CATL, structural resilience centers on securing upstream critical resource stability,

whereas for LG Electronics, it depends more heavily on visibility and integration capabilities across the entire supply network. Therefore, supply chain structural resilience constitutes a multidimensional concept whose development path must be tailored to an enterprise's position within the supply network and its distinctive organizational characteristics.

4.2. The Core of Collaborative Resilience: Breaking "Dynamic Response Barriers" Within Organizations

The comparative analysis of CATL and LG Electronics strongly supports the central importance of information processing theory in supply chain disruption research [10]. This theoretical framework posits that supply chain disruptions represent unconventional crises requiring processing of highly uncertain information, where conventional information flows and organizational structures prove inadequate for crisis-related information processing needs. Although these two industry leaders faced different specific supply chain disruption challenges, both exposed common deficiencies in slow information circulation and inefficient cross-departmental decision-making during crises. This indicates that static contingency documents cannot activate dynamic organizational response capabilities.

This finding resonates with core conclusions from recent research, confirming that efficient internal collaboration serves as a necessary precondition for activating supply chain resilience. Both empirical researches demonstrating that internal collaboration and information sharing levels directly positively influence enterprise performance and recovery speed [11], and an emphasis on supply chain responsiveness and collaboration as essential prerequisites for supply chain resilience [7], collectively point to one conclusion: inadequate coordination causes any technical contingency plan to fail at the implementation level. Therefore, enhancing supply chain resilience intrinsically requires fundamentally optimizing organizational information processing architectures and emergency decision-making mechanisms to achieve efficient coordination and information transmission, thereby transforming static contingency plans into dynamic command and action.

5. Conclusion

This research elucidates the complex interplay between external structural dependencies and internal coordination mechanisms as determinants of supply chain resilience. Through the comparative examination of CATL and LG Electronics, it becomes evident that even technologically advanced enterprises with formally robust contingency systems remain vulnerable to disruption response failures. CATL's case underscores that resilience cannot be achieved through supplier diversification alone when deep dependencies on strategic upstream resources persist. In contrast, LG's challenges reveal that structural vulnerabilities may also arise from deficits in visibility and integration across multi-tier supply networks. Together, these cases affirm that supply chain resilience is a multi-dimensional construct, requiring tailored strategies that reflect a firm's position in the global supply network and its internal organizational capabilities.

Moreover, both cases highlight a consistent weakness in internal coordination—information asymmetry, functional silos, and slow decision-making—that impedes the activation of predefined contingency measures. This supports the theoretical proposition that static plans, without dynamic organizational enablers, are insufficient under high-uncertainty conditions. Information processing theory offers a compelling lens here: when disruption strikes, conventional communication channels and hierarchical structures often fail to meet the intensified need for rapid, cross-functional interpretation and action. Therefore, enhancing resilience necessitates not only structural redesign—such as strategic buffer placement and multi-sourcing—but also the deliberate cultivation of agile internal coordination. This includes integrated data systems, interdisciplinary crisis teams, and delegated authority protocols that together enable a swift and synchronized response.

Ultimately, this study contributes to a refined understanding of supply chain resilience by integrating external structural and internal organizational perspectives. It calls for a shift in

managerial focus from reactive contingency planning to proactive resilience building—where control over critical resources is prioritized over sheer supplier numbers, and where organizational architectures are designed to enable adaptation, learning, and dynamic response. For future research, we recommend further exploration of digital tools—such as AI-driven visibility platforms and blockchain-enabled traceability systems—in mitigating both structural and coordination-related vulnerabilities. In an era of escalating disruptions, the ability to transform unforeseen crises into opportunities for strategic growth will distinguish resilient enterprises from those perpetually at risk.

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