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Continuity & Resilience in the Aerospace Supply Chain: Lessons from Global Disruptions

Yane Caroline Pinheiro dos Santos Brunacio
University of the Cumberlands

ABSTRACT: Aerospace supply chains are characterized by long lead times, high regulatory requirements, and tightly synchronized production systems, which make them particularly vulnerable during global disruptions. Under conditions of systemic stress, traditional efficiency-driven supply chain models often prove insufficient to ensure operational continuity. This paper examines continuity and resilience mechanisms in aerospace supply chains during periods of global disruption, drawing on observed operational practices and execution-focused coordination models. The study highlights how prioritization, bottleneck management, supplier proximity, and real-time visibility enable organizations to sustain operations despite severe constraints. The findings suggest that resilience in aerospace supply chains depends less on advanced planning models and more on disciplined execution, cross-functional alignment, and visibility across supplier networks. While grounded in the aerospace industry, the insights presented are applicable to other complex and highly regulated supply chains facing increasing volatility.

KEYWORDS: Aerospace supply chain; supply chain resilience; operational continuity; disruption management; execution-oriented supply chains

1. INTRODUCTION

1.1. Background and Problem Statement

Aerospace supply chains are among the most complex and highly regulated industrial networks in the global economy. Characterized by long lead times, low tolerance for defects, strict certification requirements, and tightly synchronized production schedules, these supply chains are designed primarily to ensure precision, reliability, and regulatory compliance rather than operational flexibility (Christopher, 2016; Kraljic, 1983). Under stable conditions, such structures support high levels of efficiency and product integrity. However, during periods of global disruption, the same characteristics can significantly amplify systemic fragility.

Recent global disruptions have exposed critical vulnerabilities across aerospace supply networks, including the COVID-19 pandemic, geopolitical conflicts, transportation bottlenecks, and labor shortages. Unlike industries that can rapidly substitute suppliers or adjust product configurations, aerospace manufacturers and suppliers operate under rigid qualification processes, contractual delivery obligations, and regulatory constraints that severely limit short-term adaptability (Lücker et al., 2024). Failure to meet delivery commitments in this context often results in substantial contractual penalties, escalation clauses, and long-term commercial exposure, further increasing operational and financial risk during disruption periods.

Traditional aerospace supply chain management has historically emphasized efficiency-driven models, such as lean inventories, optimized lead times, and forecast-based planning. While effective in predictable environments, growing evidence suggests that these approaches are insufficient to ensure operational continuity under conditions of high uncertainty (Barbosa-Póvoa & Novais, 2018; Chang & Lin, 2019). During systemic shocks, forecasting accuracy deteriorates rapidly, supplier commitments become unreliable, and lead-time assumptions lose validity. At the same time, the strict quality requirements necessary for aircraft certification restrict the use of alternative components or unqualified suppliers, limiting the ability to recover through substitution and increasing dependency on disciplined execution and coordination.

Supply chain resilience has therefore emerged as a critical capability for managing disruption risk. Resilience refers not only to the ability to recover from disruptions but also to the capacity to absorb shocks, adapt operational priorities, and sustain critical flows during periods of extreme stress (Roshani et al., 2024). In aerospace supply chains, resilience is closely linked to continuity, the ability to maintain production, deliveries, and contractual performance despite constrained resources, stringent certification requirements, and volatile external conditions. Moreover, aerospace supply chains exert a systemic influence on a wide range of downstream and adjacent industries, including defense, transportation, energy, and advanced manufacturing, amplifying the broader economic impact of supply chain failures beyond the aerospace sector itself.

Despite extensive conceptual discussion in the literature, practical insights into how aerospace organizations operationalize continuity and resilience during real-world disruptions remain limited. This gap motivates the present study. This paper examines mechanisms of continuity and resilience in aerospace supply chains during periods of global disruption, with a particular focus on execution-oriented coordination. Rather than emphasizing advanced predictive models, the analysis highlights how prioritization, bottleneck management, supplier proximity, and real-time visibility enable organizations to sustain operations under severe constraints. By examining observed operational practices during systemic disruptions, this study contributes applied insights into how aerospace supply chains transition from efficiency-driven planning toward execution-focused resilience. While grounded in aerospace-specific dynamics, the lessons discussed are relevant to other complex and highly regulated supply chains facing increasing volatility and uncertainty.

1.2. Objectives

The objective of this study is to examine how aerospace supply chains sustain operational continuity during periods of global disruption. Specifically, the paper aims to analyze execution-oriented coordination mechanisms that support supply chain resilience under conditions of systemic stress. These mechanisms include prioritizing critical components, managing bottlenecks, leveraging supplier proximity, fostering cross-functional coordination, and using real-time visibility tools. By focusing on observed operational practices rather than predictive or optimization-based models, this study seeks to provide practical insights applicable to highly regulated and complex supply chain environments.

1.3. Significance of the Study

This study contributes to the supply chain management literature by addressing the gap between conceptual resilience frameworks and their practical implementation in highly regulated industries. While existing research extensively discusses resilience at a theoretical level, fewer studies examine how organizations operationalize continuity when certification requirements, contractual penalties, and limited supplier redundancy constrain flexibility. By focusing on aerospace supply chains, this paper highlights resilience mechanisms in an environment where failure to meet delivery and quality requirements can result in substantial financial penalties and certification risks. The findings are particularly relevant for supply chain practitioners, procurement leaders, and operations managers responsible for maintaining continuity in critical industrial ecosystems with systemic economic impact.

1.4. Scope of the Study

This study focuses on aerospace supply chains operating in globally interconnected and highly regulated environments. The analysis is based on qualitative and applied observations of operational practices during periods of systemic disruption, rather than on empirical hypothesis testing or statistical modeling. While the discussion centers on aerospace-specific dynamics, the insights presented apply to other industries characterized by long lead times, strict compliance requirements, and complex supplier networks, such as defense, transportation, and advanced manufacturing. The study does not aim to provide a comprehensive quantitative assessment but instead emphasizes execution-oriented perspectives on continuity and resilience.

2. GLOBAL DISRUPTIONS AND THE AEROSPACE SUPPLY CHAIN

Global disruptions have become a defining characteristic of contemporary supply chain environments. Events such as pandemics, geopolitical conflicts, trade restrictions, transportation bottlenecks, and labor shortages increasingly occur simultaneously, generating compound risks that propagate across global supply networks. Aerospace supply chains are particularly exposed to these disruptions due to their high level of interdependence, long planning horizons, and strict regulatory constraints governing production, sourcing, and certification (Christopher, 2016; Lücker et al., 2024).

Unlike consumer-oriented industries, aerospace supply chains operate under rigid qualification and certification regimes. Suppliers must comply with stringent regulatory frameworks and quality management standards, which significantly limit the ability to rapidly switch sources or reconfigure product designs during disruption events (Kraljic, 1983). As a result, disruptions affecting a single tier can cascade across multiple production programs and geographic regions, such as raw material shortages, specialized manufacturing delays, or logistics interruptions.

Recent global crises have demonstrated how aerospace supply chains are vulnerable to synchronized shocks across supplier networks. During the COVID-19 pandemic, production capacity, logistics flows, and workforce availability were disrupted simultaneously, exposing the fragility of highly optimized and lean operating models (Lücker et al., 2024). Similarly, geopolitical tensions, sanctions, and trade restrictions have affected supplier access, lead times, and cross-border transportation reliability, further increasing uncertainty within aerospace procurement and production systems.

A defining characteristic of aerospace supply chains during global disruptions is the persistence of contractual and operational obligations despite deteriorating external conditions. Delivery schedules, customer commitments, and certification requirements often remain unchanged, even as supplier performance and logistics reliability decline. Failure to meet contractual delivery requirements can result in substantial financial penalties, escalation clauses, and long-term reputational damage, placing additional pressure on procurement and operations teams to sustain continuity under constrained conditions (Chang & Lin, 2019).

Furthermore, aerospace supply chains frequently rely on specialized suppliers with limited redundancy. These suppliers often serve multiple original equipment manufacturers (OEMs) simultaneously, creating competition for constrained capacity during periods of disruption. When demand recovery is uneven across programs, supplier allocation decisions can significantly influence production continuity and delivery performance across the network. In such contexts, early identification of emerging constraints and visibility into supplier operations become critical to sustaining operational continuity.

The cumulative effect of these factors highlights the limitations of traditional disruption management approaches that rely primarily on forecast adjustments or inventory buffering. While such measures can mitigate localized risks, they are insufficient when disruptions affect multiple tiers and functions concurrently. As global disruptions increase in frequency and severity, aerospace supply chains must shift from reactive mitigation toward structured resilience and continuity mechanisms that emphasize execution, coordination, and real-time decision-making. This transition provides the foundation for examining resilience and continuity concepts in the existing supply chain literature, which is addressed in the following section.

3. LITERATURE REVIEW

3.1. Supply Chain Resilience

Supply chain resilience has been defined in the literature as a firm’s ability to prepare for, respond to, and recover from disruptive events while maintaining acceptable levels of operational performance. Early studies conceptualized resilience primarily as recovery capability, emphasizing the speed at which supply chains return to pre-disruption performance levels (Christopher, 2016). More recent research expands this view by framing resilience as a multidimensional construct encompassing resistance, absorption, adaptation, and transformation capabilities (Barbosa-Póvoa & Novais, 2018; Roshani et al., 2024).

Within complex industrial supply chains, resilience is increasingly associated with visibility, collaboration, and risk awareness across multiple tiers. Studies highlight that resilient supply chains rely on early detection of disruptions, information sharing with suppliers, and coordinated response mechanisms rather than isolated mitigation actions (Chang & Lin, 2019). However, much of the existing literature treats resilience at a conceptual or system-design level, often focusing on network reconfiguration, redundancy, or inventory strategies, with limited attention to day-to-day operational execution during disruption.

In aerospace supply chains, resilience is further constrained by regulatory requirements and certification processes, which limit structural flexibility. As a result, resilience mechanisms in this context must rely more on coordination, prioritization, and disciplined execution than on rapid structural changes. This highlights the need to examine resilience not only as a strategic design principle but also as an operational capability embedded in execution practices.

3.2. Continuity versus Efficiency in Regulated Supply Chains

Efficiency-oriented supply chain models, such as lean operations and just-in-time inventory systems, have long been promoted as best practices for reducing costs and optimizing operations. These approaches prioritize waste elimination, forecast accuracy, and tightly synchronized production flows (Kraljic, 1983). While effective under stable conditions, growing evidence suggests that excessive emphasis on efficiency can increase vulnerability to disruption, particularly in environments characterized by high uncertainty and limited flexibility (Lücker et al., 2024).

The trade-off between efficiency and continuity becomes especially pronounced in highly regulated industries such as aerospace. Strict quality and certification requirements restrict supplier substitution and component redesign, reducing the feasibility of traditional risk mitigation strategies. Consequently, continuity emerges as a distinct operational objective rather than a byproduct of efficiency, the ability to sustain production, deliveries, and contractual performance during disruption.

Recent studies argue that resilient supply chains must balance efficiency with robustness and adaptability, acknowledging that short-term inefficiencies may be necessary to preserve long-term operational stability (Barbosa-Póvoa & Novais, 2018). However, the literature provides guidance on how organizations operationalize this balance during real disruption scenarios, particularly when contractual penalties and certification risks constrain decision-making. This gap is especially relevant for aerospace supply chains, where supply disruptions can have cascading effects across multiple industrial sectors.

3.3. Execution, Visibility, and Coordination During Disruptions

Execution-oriented coordination has gained increasing attention as a critical enabler of supply chain performance during disruption. Rather than relying solely on predictive planning models, execution-focused approaches emphasize real-time decision-making, cross-functional alignment, and proximity to operational constraints (Chang & Lin, 2019). These practices enable organizations to respond dynamically as conditions evolve, reallocating resources and priorities based on actual system behavior rather than static forecasts.

Visibility plays a central role in enabling effective execution. Real-time access to information on supplier capacity, production status, logistics flows, and risk indicators enables faster escalation and more informed decision-making. Prior research highlights that visibility reduces coordination delays, improves responsiveness, and enhances trust across supply chain partners, particularly under conditions of stress (Christopher, 2016).

In multi-tier aerospace supply chains, execution-oriented coordination often extends beyond internal functions to include direct engagement with suppliers. Close interaction with critical suppliers enables early identification of bottlenecks, improved alignment of priorities, and more effective allocation of constrained capacity. Despite its practical importance, execution-focused coordination remains underrepresented in the academic literature, which tends to emphasize planning models and structural resilience strategies.

Table 1 synthesizes key themes in the supply chain resilience literature and highlights the primary limitations relevant to highly regulated industries such as aerospace. These limitations underscore the need for applied research that examines how execution-oriented continuity mechanisms are operationalized under regulatory, contractual, and operational constraints, thereby motivating the research gaps discussed in the following section.

Table 1. Synthesis of Key Literature on Supply Chain Resilience

Theme	Primary Focus in the Literature	Identified Limitations
Supply chain resilience	Recovery capability, robustness, and adaptive capacity following disruptions	Predominantly conceptual, with limited emphasis on operational execution during real-time disruptions
Efficiency-oriented supply chains	Lean operations, cost optimization, and forecast-driven planning	Increased vulnerability under systemic shocks and constrained environments
Visibility and coordination	Information sharing, digital visibility tools, and cross-organizational collaboration	Limited integration between visibility mechanisms and execution-oriented decision-making
Regulated and aerospace supply chains	Compliance, certification requirements, and quality assurance frameworks	Scarcity of applied studies addressing continuity and resilience under strict regulatory constraints

3.4. Research Gaps in Aerospace Supply Chain Resilience

Although the literature provides valuable insights into supply chain resilience, several gaps remain, particularly in the context of aerospace supply chains (Christopher, 2016; Barbosa-Póvoa & Novais, 2018). First, many studies focus on resilience at a conceptual or design level, with limited examination of how resilience is enacted through operational practices during real-world disruptions (Barbosa-Póvoa & Novais, 2018; Chang & Lin, 2019). Second, existing research often assumes a degree of flexibility that is not present in highly regulated environments, overlooking the constraints imposed by certification requirements and contractual obligations (Kraljic, 1983; Chang & Lin, 2019).

Moreover, the interaction between continuity, execution, and resilience remains insufficiently explored (Roshani et al., 2024). While continuity is frequently mentioned as an outcome of resilience, fewer studies analyze it as an explicit operational objective requiring distinct coordination mechanisms (Christopher, 2016; Roshani et al., 2024). Finally, the systemic role of aerospace supply chains has received limited attention in resilience research, as performance affects the defense, transportation, energy, and advanced manufacturing sectors (Christopher, 2016; Lücker et al., 2024).

These gaps underscore the need for applied research examining how aerospace organizations sustain continuity during disruption through execution-oriented mechanisms (Barbosa-Póvoa & Novais, 2018; Chang & Lin, 2019; Sheffi & Rice, 2005). Addressing this gap, the present study focuses on practical coordination practices that enable resilience under conditions of limited flexibility, contributing to a more operationally grounded understanding of aerospace supply chain resilience (Roshani et al., 2024).

4. CONCEPTUAL FRAMEWORK

The frequency and severity of global disruptions have challenged traditional supply chain management approaches that rely primarily on planning, forecasting, and efficiency optimization (Christopher, 2016; Chang & Lin, 2019). In highly regulated environments such as aerospace, where flexibility is constrained by certification requirements, contractual obligations, and limited supplier redundancy, continuity and resilience must be operationalized through execution-oriented mechanisms (Barbosa-Póvoa & Novais, 2018; Kraljic, 1983). Building on the literature reviewed and the contextual analysis presented, this study proposes a conceptual framework that explains how execution-based coordination enables continuity and resilience in aerospace supply chains during periods of disruption.

The proposed framework positions global disruptions as external shock events that introduce systemic uncertainty and operational constraints across multiple supply chain tiers (Christopher, 2016; Lücker et al., 2024; Ivanov, 2020). These disruptions affect supplier capacity, logistics reliability, workforce availability, and information accuracy, undermining traditional planning assumptions (Chang & Lin, 2019). In response, aerospace organizations activate a set of execution-oriented continuity mechanisms designed to manage constraints dynamically rather than eliminate them (Barbosa-Póvoa & Novais, 2018).

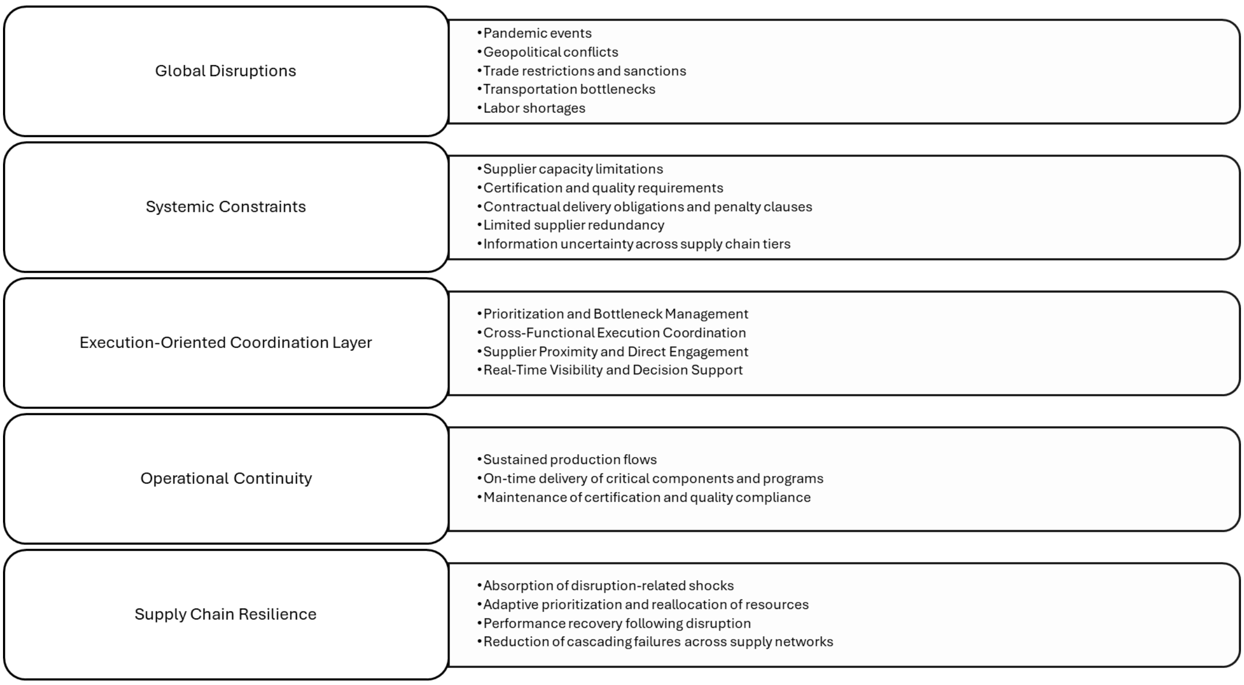
Within the framework, execution-oriented mechanisms consist of four interrelated dimensions: prioritization and bottleneck management, cross-functional execution coordination, supplier proximity and direct engagement, and real-time visibility and decision support (Roshani et al., 2024; Tuomikangas & Kaipia, 2014). Prioritization and bottleneck management enable organizations to allocate constrained resources toward the most critical components, programs, and deliveries, thereby reducing the risk of cascading failures across interconnected production systems (Roshani et al., 2024; Christopher, 2016). Cross-functional execution coordination facilitates rapid alignment among procurement, operations, quality, logistics, and program management, ensuring execution decisions remain compliant with regulatory and contractual requirements (Chang & Lin, 2019).

Supplier proximity and direct engagement enhance visibility into upstream constraints and support collaborative problem-solving under conditions of limited redundancy (Kraljic, 1983; Lücker et al., 2024). Rather than relying on transactional communication, close supplier interaction enables earlier identification of risks and more effective allocation of constrained supplier capacity (Christopher, 2016). Real-time visibility and decision-support systems integrate information across multiple tiers of the supply chain, providing situational awareness that supports timely and informed execution decisions as conditions evolve (Christopher, 2016; Chang & Lin, 2019).

The framework further suggests that the interaction among these execution-oriented mechanisms enables operational continuity, defined as the sustained ability to meet production, delivery, and quality requirements during periods of disruption (Roshani et al., 2024). Continuity, in turn, contributes to supply chain resilience by enabling organizations to absorb shocks, adjust operational priorities, and restore performance without compromising certification or contractual integrity (Barbosa-Póvoa & Novais, 2018; Chang & Lin, 2019). Notably, the framework emphasizes that resilience in aerospace supply chains is not solely a function of structural design or redundancy, but a dynamic capability rooted in disciplined execution and coordination under constraints (Christopher, 2016).

Although developed in the context of aerospace supply chains, the proposed conceptual framework applies to other highly regulated and complex industries characterized by long lead times, stringent compliance requirements, and systemic interdependencies (Barbosa-Póvoa & Novais, 2018). By linking execution-oriented mechanisms to outcomes of continuity and resilience, the framework provides a practical lens for understanding how organizations navigate disruption when flexibility is inherently limited (Roshani et al., 2024).

Figure 1. Execution-Oriented Continuity Framework for Aerospace Supply Chains



4.1. Methodology

This study adopts a qualitative, conceptual research approach to examine mechanisms of continuity and resilience in aerospace supply chains under conditions of global disruption. Conceptual research is appropriate when the objective is to develop integrative frameworks and advance theoretical understanding in areas where empirical evidence remains fragmented or limited, particularly in complex and highly regulated environments (Christopher, 2016; Barbosa-Póvoa & Novais, 2018).

The development of the proposed framework is grounded in a structured review of the academic literature on supply chain resilience, continuity management, disruption response, and execution coordination. Prior studies addressing resilience in regulated industries and multi-tier supply chains were systematically analyzed to identify dominant themes, assumptions, and limitations, providing the theoretical foundation for the framework (Chang & Lin, 2019; Roshani et al., 2024).

In addition to the literature review, the study incorporates an analytical synthesis of observed execution-oriented practices in the aerospace supply chain during recent global disruptions. These observations include cross-functional coordination, prioritization of constrained components, supplier engagement under certification constraints, and continuity-focused decision-making. Rather than presenting firm-specific case data, the analysis focuses on identifying recurring coordination mechanisms that support operational continuity across disruption scenarios (Christopher, 2016).

The conceptual framework was developed through an iterative synthesis process, in which insights from the literature were compared with execution practices observed in real-world settings. This process enabled the identification of core execution-oriented mechanisms that consistently support continuity and resilience when structural flexibility is limited (Barbosa-Póvoa & Novais, 2018).

This methodological approach emphasizes analytical generalization rather than statistical generalization. While the framework is developed within the aerospace supply chain context, its underlying logic is applicable to other highly regulated and complex industries characterized by long lead times, stringent compliance requirements, and systemic interdependencies (Chang & Lin, 2019).

5. DISCUSSION

This study contributes to the growing body of literature on supply chain resilience by advancing an execution-oriented perspective tailored to the aerospace industry. The proposed conceptual framework directly addresses the research gaps identified in prior studies, particularly the limited attention to how resilience is operationalized through coordination and execution practices under regulatory and contractual constraints (Christopher, 2016; Barbosa-Póvoa & Novais, 2018).

5.1. Addressing the Identified Research Gaps

Existing resilience research has largely emphasized structural design, redundancy, and planning-based strategies, often assuming levels of flexibility that are not feasible in highly regulated environments, such as the aerospace supply chain (Chang & Lin, 2019). By contrast, the framework proposed in this study highlights execution-oriented coordination as a central mechanism for sustaining continuity during disruption. This perspective extends prior work by shifting the focus from resilience as a static design property to resilience as a dynamic, execution-based capability enacted under constraints (Roshani et al., 2024).

Moreover, the framework explicitly positions **continuity** as an operational objective rather than a passive outcome of resilience. While continuity has been widely referenced in the literature, few studies have examined the specific coordination mechanisms required to maintain certified production and delivery flows during systemic disruptions (Christopher, 2016). By linking continuity to prioritization, cross-functional coordination, supplier engagement, and real-time visibility, this study provides a more granular understanding of how continuity is sustained in aerospace contexts.

5.2. Theoretical Implications

From a theoretical perspective, the proposed framework contributes to supply chain resilience literature by integrating execution-oriented mechanisms into existing resilience constructs. Prior models have often emphasized flexibility, buffering, and network redesign as primary enablers of resilience (Barbosa-Póvoa & Novais, 2018). While these approaches remain relevant, the findings of this study suggest that, in highly regulated supply chains, resilience is better understood as a coordination capability rooted in disciplined execution rather than structural adaptability alone.

The framework also reinforces the role of systemic interdependencies in resilience outcomes. Aerospace supply chains operate as critical infrastructures whose performance affects multiple downstream sectors, including defense, transportation, and advanced manufacturing. By explicitly incorporating systemic constraints and cross-tier interactions, the framework aligns with calls for more holistic and context-sensitive resilience theories (Christopher, 2016; Lücker et al., 2024).

5.3. Practical and Managerial Implications

The findings of this study have important implications for supply chain managers operating in aerospace and similarly regulated industries. First, the framework suggests that resilience initiatives should move beyond contingency planning and inventory buffering toward execution-focused coordination mechanisms. Establishing cross-functional execution forums, often resembling execution-oriented S&OP or integrated business planning processes, enables faster prioritization and trade-off decisions under disruption.

Second, the emphasis on supplier proximity and direct engagement highlights the strategic value of relational coordination in environments with limited supplier redundancy. Investing in closer supplier collaboration enhances visibility, accelerates problem resolution, and supports more effective allocation of constrained capacity during periods of disruption (Kraljic, 1983; Lücker et al., 2024).

Finally, the framework underscores the importance of real-time visibility as an enabler of informed execution. Rather than relying solely on forecast-driven planning, organizations benefit from monitoring actual system behavior and dynamically adjusting priorities. These practices support continuity without compromising certification, quality, or contractual integrity, which are critical performance dimensions in aerospace supply chains.

Overall, the discussion reinforces the argument that resilience in aerospace supply chains is not primarily achieved through structural flexibility, but through disciplined execution and coordinated decision-making under constraints. By articulating this shift, the study provides both theoretical clarity and practical guidance for managing continuity in increasingly volatile global supply chain environments.

6. CONCLUSION

This study examined continuity and resilience in aerospace supply chains through an execution-oriented lens, addressing the limitations of traditional planning- and efficiency-driven approaches in highly regulated environments. By integrating insights from the resilience literature with analytical synthesis of execution practices observed during global disruptions, the paper proposed a conceptual framework that explains how coordinated execution mechanisms enable operational continuity under conditions of constrained flexibility.

The primary contribution of this study lies in repositioning resilience as a dynamic execution-based capability rather than solely a function of structural design, redundancy, or flexibility. The framework highlights four interrelated mechanisms that collectively sustain continuity during disruption: prioritization and bottleneck management; cross-functional execution coordination; supplier proximity and direct engagement; and real-time visibility and decision support. By explicitly positioning continuity as an operational objective, the study advances a more granular and practice-oriented understanding of resilience in aerospace supply chains.

From a theoretical standpoint, the findings contribute to supply chain resilience research by extending existing models to account for regulatory, contractual, and certification constraints that characterize aerospace and other highly regulated industries. The framework responds to calls for more context-sensitive resilience theories by incorporating systemic interdependencies and execution dynamics that are often underrepresented in the literature.

In practice, the study offers actionable insights for managers responsible for maintaining certified production and delivery performance during disruptions. The results suggest that resilience initiatives emphasize execution-focused coordination, including cross-functional decision forums and closer supplier engagement, rather than relying exclusively on forecast-driven planning or inventory buffers. These practices support disciplined decision-making and continuity without compromising quality or compliance requirements.

This study has limitations inherent to conceptual research. The framework is not empirically tested and does not capture firm-specific variations in organizational structure or digital maturity. Future research could empirically validate the proposed framework through case studies, interviews, or longitudinal analyses across aerospace programs and supply tiers. Additionally, comparative studies across other regulated industries could further refine the applicability and boundary conditions of execution-oriented resilience mechanisms.

In conclusion, as global disruptions become more frequent and complex, aerospace supply chains must move beyond planning-centric resilience strategies toward execution-oriented coordination models. The framework proposed in this study provides a practical, theoretically grounded lens for understanding how organizations sustain continuity and resilience despite inherent limitations on flexibility.

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