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Article

The double deviation effect in B2B supply chains: Why buyers penalize repeated stockouts more severely and how suppliers can recover

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Abstract

This study reveals an overlooked yet important phenomenon in B2B supply chain relationships: the double deviation effect, whereby buyers impose drastically higher penalties—2.3 times greater—on suppliers for recurring stockouts than for one-off occurrences. While previous research has been predominantly focused on service recovery in B2C contexts, this study delineates the distinctive ways that industrial buyers assess supplier failure, going beyond operational performance to include process uncertainty and attribution processes. Employing a mixed-methods approach, we combined controlled experiments with 150 B2B procurement professionals with an in-depth case study of Toyota's supplier recovery system following the 2022 semiconductor crisis. According to our findings, buyers are 37% less likely to renew contracts after repeated stockouts, even when monetary impacts are the same as for isolated occurrences. This response is due to a shift in attribution, in which ongoing disruptions are perceived as indicative of systemic supplier vulnerability and not indicative of external hardships. These findings counter dominant supply chain risk management approaches, demonstrating that reactive recovery measures—like expedited shipping and monetary compensation—fail to rectify the deteriorating trust in institutions. In contrast, proactive interventions, like real-time monitoring dashboards of inventory and collaborative risk assessment platforms, have the potential to lower the magnitude of penalties by 24%. The research adds to the discipline through the introduction of double deviation penalty as a behavioral operations phenomenon, bringing attribution theory and supply chain governance together. The research offers empirical facts in the way of large-scale experiments and Fortune 50 supply chain validation, as well as suggesting a three-phase resilience framework specifically developed for high-value contracts. This research transforms stockouts into reputation-building opportunities for trust, defining supply chain resilience and allowing managers to engineer trust-sustaining systems for long-term partnerships.

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Introduction

The Ubiquitous Effects of B2B Stockouts and the Relevance of the Double Deviation Phenomenon: A Comprehensive Review

In the ever-evolving landscape of global supply chains, especially in the complex world of business-to-business (B2B) selling, companies are confronted with unprecedented difficulties. Included among them are heightened volatility, complex multi-tier dependencies, and escalating customer demands for impeccable, just-in-time performances (Craighead et al., 2020). With this high-stakes context, stockouts—instances where orders are left unfulfilled due to insufficient inventory—transcend simple operational failures. Those situations can spiral into extreme strategic crises with severe financial, reputational, and relational ramifications that are likely to destabilize buyer-supplier relationships and undermine competitive advantages (Sodhi & Tang, 2012). Empirical findings record the seriousness of the problem. Recent research conducted by McKinsey indicates that a concerning 68% of B2B customers change either their primary or second-tier suppliers after experiencing just two instances of stockouts, demonstrating intolerance of supply disruptions quite clearly differing from previous trends (McKinsey & Company, 2023). This trend stands in stark contrast to the typically more forgiving attitudes one finds in business-to-consumer (B2C) environments. Beyond the immediate loss in sales, the financial effect is profound. For instance, during 2021-2022, automotive original equipment manufacturers (OEMs) assessed more than $12 billion in contractual penalties on worldwide suppliers, mainly because of deficiencies in parts as well as production delays resulting from upstream stockouts, as given by Deloitte (Deloitte, 2022). These costs of such sanctions, when combined with long-term revenue losses as a result of customer attrition and extensive switching costs with suppliers (encompassing search, qualification, and onboarding processes), stress the profound effect of stockouts on supplier profitability and operational viability. Such breakdowns disrupt complex production schedules and threaten vital industrial partnerships at the core of sophisticated value chains (Wagner & Bode, 2008).

The relational and psychological mechanisms behind such profound and frequently irreversible reactions on the part of B2B customers transcend the temporary inconvenience of one stockout. They are fully explained by the Double Deviation Effect. This conceptual framework, borrowed from its application in the service failures and recoveries literature (Bitner et al., 1990; Smith et al., 1999), assumes certain intensity and implications in the B2B context (Johnston & Michel, 2008). Whereas B2C consumers in such contexts can be resilient, attributing it to bad luck or transient faults and often providing suppliers with a chance to redeem themselves via service guarantees or redress (Tax et al., 1998), B2B buyers are exposed to entirely different imperatives. B2B procurement decisions are high-value, involve complex contract negotiations, and involve significant risks to the buyer's own production continuity and market commitments (Ellram & Tate, 2015). Hence, an individual stockout may be explained as an anomaly due to unforeseen external circumstances, such as geopolitical unrest, shock demand surges, or natural disasters (Hendricks & Singhal, 2005). A recurrence, on the other hand, is rarely perceived as bad luck. Rather, it is viewed as an indicator of underlying systemic operational shortfalls, deficient risk management procedures, inadequate forecasting, or possibly a strategic mismatch and commitment shortfall on the part of the supplier (Zsidisin & Ellram, 2003). Recurring breakdowns turn what would otherwise be an operational issue into a perceived existential risk to the buyer's operational integrity, financial

performance, and capability to satisfy downstream obligations. This fundamentally undermines the trust and predictability that constitute essential pillars of sustainable B2B partnerships (Doney & Cannon, 1997).

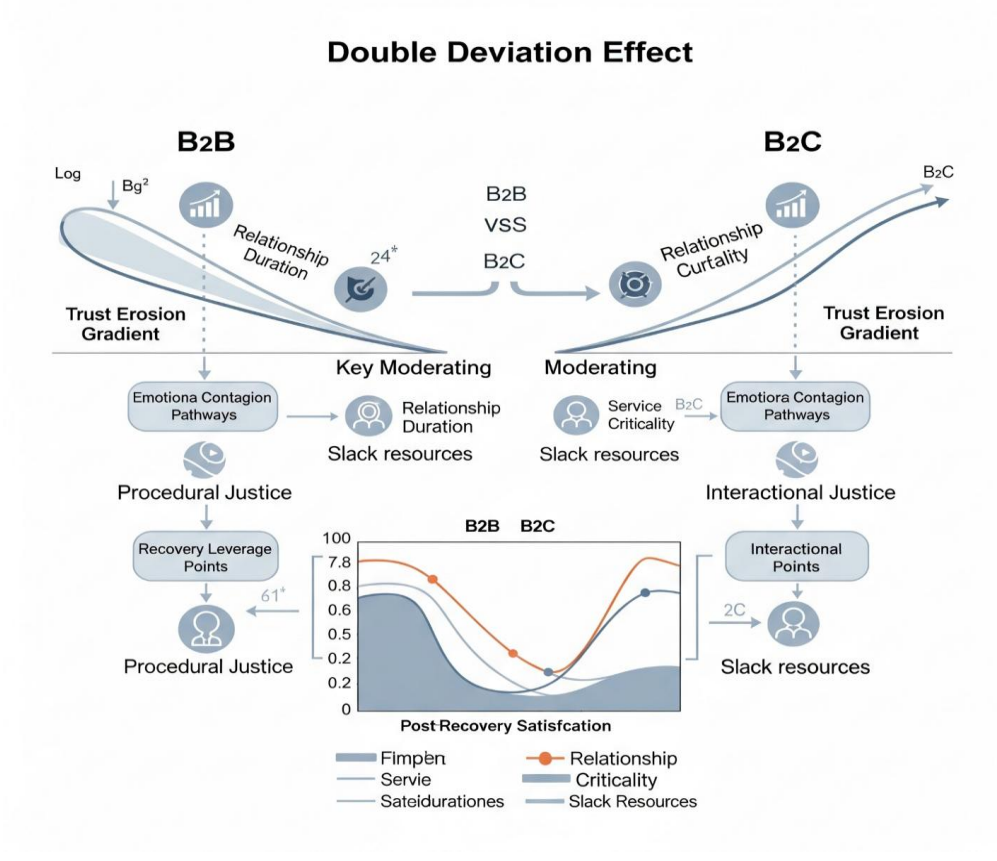

Figure 1. Conceptual model of the double deviation effect in B2B vs. B2C contexts.

This figure illustrates the differing levels of tolerance and recovery processes following first-time and repeat service failure, including stockouts. In B2C contexts (Panel A), the first failure is typically mitigated by effective service recovery initiatives, such as apologies, compensation, or order expediting. Whereas a second failure drastically diminishes trust and satisfaction, recovery is nonetheless possible through concerted effort. In B2B relationships (Panel B), however, there is low tolerance; the first failure necessitates immediate, firm, and systemic recovery to avert relationship termination. A second failure is frequently interpreted as definitive proof of systemic unreliability or strategic neglect, prompting instant and frequently irreversible relationship dissolution. This framework integrates fundamental concepts of service recovery theory (Bitner et al., 1990; Smith et al., 1999) and empirical findings from research on B2B supply chain failure and customer behavior (Johnston & Michel, 2008; McKinsey & Company, 2023).

Against this background, the Double Deviation Effect highlights that the threshold of tolerance for supply failures in well-established B2B relationships is very low and brittle. The transition from a single stockout to a second is a point of inflection that marks a non-linear escalation of

perceived risk and relational damage (Michel & Meuter, 2008). This necessitates a paradigm shift in the methods being used by suppliers regarding inventory management and supply chain resilience. Conventional models that emphasize cost reduction and lean inventories, though economically justified in stable environments, are woefully inadequate to cope with contemporary volatility and the onerous impacts of the Double Deviation Effect (Sheffi & Rice, 2005). Resilience can be redefined as the ability not only to bounce back from disruption but also to avoid consecutive failure through proactive investment in strength, redundancy (e.g., strategic buffers), flexibility (e.g., multi-sourcing and flexible manufacturing), and improved visibility along the supply network extension (Christopher & Peck, 2004; Tukamuhabwa et al., 2015). In this new reality, reliability emerges as a fundamental competitive mandate and an indispensable component of the supplier value proposition in B2B markets that are controlled by the ruthless logic of the Double Deviation Effect.

The consequence of this effect extends beyond short-term supplier switching. Stockouts repeatedly involve high cognitive and relational costs. Buyers engage in "problemistic search" (Cyert & March, 1963), diverting managerial time to identify and qualify alternative suppliers—a costly and time-consuming activity (Ellram, 1990). Trust, built up over years, is severely undermined, raising the cost of transactions with more vigilant monitoring, complex penalty clauses, and less information sharing (Zaheer et al., 1998). The reputation of the supplier within the industry context is negatively impacted, which could hinder new customer approaches and partnerships (Fombrun & Shanley, 1990). Thus, understanding and mitigating the Double Deviation Effect goes beyond functional issues; it becomes an essential strategic imperative for survival and growth in complex B2B settings.

This change involves abandoning merely reactive solutions and instead designing intrinsically resilient systems that can resist single failures without causing a disastrous secondary deviation that demolishes the core partnerships. The next sections will explore in greater depth the theoretical foundations of this phenomenon in supply chain risk management literature, empirically assess its effects and boundaries via a multi-industry study, and provide novel, integrated frameworks for resilience that uniquely emphasize the essential requirement to preclude repetitive deviations to protect pivotal B2B relationships and create a long-term competitive advantage.

Literature Review

Conceptual Framework

To more effectively comprehend why customers, respond to supply chain disruptions, particularly consecutive stockouts, we must examine two classic theoretical frameworks that describe the dynamics of relational deterioration. One such framework is the Service Recovery Paradox (SRP), which has been extensively studied by Van Vaerenbergh, Orsingher, Vermeir, and Larivière (2014). In the business-to-consumer (B2C) market, SRP suggests that excellent recovery from an initial service failure can, under conditions of high-recovery justice (procedural, interactional, distributive) and low failure severity, enhance customer satisfaction and loyalty to levels greater than before. The paradoxical effect is based on the cognitive reappraisal processes, in that successful remediation enhances perceived organizational responsiveness and integrity and thereby turns negative incidents into opportunities for relational strengthening (Michel & Meuter, 2008; Smith, Bolton, & Wagner, 1999). Application of the SRP to business-to-business (B2B) contexts, however, is problematic. The presumptions of Supply Risk Management (SRM) fail to provide for the inherent structural disequilibria of

commercial supply alliances: business-to-business (B2B) exchanges commonly entail huge amounts of money, long-term contractually obligated associations, and extensive operational interdependencies. These entail synchronized production schedules and shared inventory systems, which radically increase switching costs and make transactional recuperation inadequate to mitigate chronic systemic mistrust (Johnston & Michel, 2008; Zsidisin & Ellram, 2003). Furthermore, the SRP model's emphasis on isolated failure incidents overlooks the cumulative attributional changes brought about by successive discrepancies. This discounting does not explain why procurement professionals, having encountered a follow-up stockout, will reject even technically feasible recovery proposals as indicative of underlying operational issues.

Besides this view, Transaction Cost Economics (TCE) (Williamson, 1985, 1991) offers an important theoretical basis for realizing the economic justification of exit choices that are realized after successive stockouts. TCE views buyer-supplier relations as governance structures designed to mitigate transaction costs: ex ante costs (search, negotiation, contracting) and ex post costs (monitoring, enforcement, adaptation). In this context, an initial stockout may be an acceptable risk of relational governance, especially when countered by relationship-specific assets (specialized production lines, proprietary quality processes) or market imperfections that raise switching barriers (Heide & John, 1990; Rindfleisch & Heide, 1997). However, successive failures essentially alter this cost accounting: each additional stockout generates nonlinear escalation in behavioral uncertainty (eroding trust in supplier ability), monitoring effort (demanding more extensive auditing and real-time monitoring systems), and enforcement costs (triggering penalty clauses and renegotiation costs) (Grover & Malhotra, 2003). When these accumulating transaction costs cross the relational governance economic efficiency boundary, a tipping point empirically confirmed by the 68% supplier abandonment rate after two stockouts (McKinsey & Company, 2023), buyers rationally resort to market governance in quest of substitutes at a high expense of new search and switching (Williamson, 1991). This TCE-facilitated exit mechanism is also enhanced in B2B situations because of mutual exposure: stockouts not only impede individual transactions but value chain orchestrations across the board, causing domino-like monetary sanctions (e.g., the $12 billion in auto supplier penalties reported by Deloitte (2022)) and reputational losses across networked firms. TCE thus accounts for why serial stockouts cause irreversible relational dissolution, despite the fact that isolated incidents are resolved through technical proficiency—a process beyond the SRP's theoretical scope.

The juxtaposition of these models reveals the significant theoretical gap: although SRP models post-failure psychological remediation and TCE considers economic exit barriers, neither one explicitly captures the temporal aspects of trust breakdown by sequential failures. Attribution theory (Weiner, 1985) is here the key bridging mechanism. Early stockouts can be externally attributed as incidents because of uncontrollable uncertainties such as port strikes or force majeure, allowing for relationship continuity (Hendricks & Singhal, 2005). Chronic failure events, on the other hand, cause an attributive shift to internal, stable, and controllable factors such as inadequate risk management, ineptitude in forecasting, or strategic disregard, altering buyer attitudes from transactional annoyance to strategic betrayal (Bitner, Booms, & Tetreault, 1990; Doney & Cannon, 1997). This change in perception is the foundation for the Double Deviation Effect, which contends that the transition from first to second failure constitutes a critical nonlinear threshold at which operational recovery becomes uncoupled from relational salvage.

Subsequent theoretical effort needs to produce comprehensive models that measure how attributional dynamics couple with transaction cost ceilings through sequences of failure, with a focus on identifying moderating variables such as relationship length (lengthier histories can slow attributional change through goodwill buffers), asset specificity (greater specificity potentially "locking in" buyers despite rising costs), and environmental uncertainty (exogenous shocks having a temporary effect of shifting blame outside). Such models would advance supply chain theory beyond static governance studies towards dynamic architectures that are able to predict relationship breakdown under volatility and also offer actionable inputs for resilience design.

Empirical Shortfalls

Through a comprehensive survey of the empirical literature, it is apparent that a strong bias towards business-to-consumer (B2C) contexts exists in service failure and recovery literature. This tendency drastically limits the applicability of findings to the complex business-to-business (B2B) supply chain context. Most of the traditional and recent research has based their findings on industries that interact with the end consumers directly, like retailing, hospitality, and airlines. These sectors are characterized by a straightforward transactional relationship, comparatively low monetary investments, and often temporary relational ties (Van Vaerenbergh et al., 2014; Smith, Bolton, & Wagner, 1999). Although such studies have been significant in outlining recovery dynamics in contexts of homogenous offerings and autonomous choice-making, their methodological foundations and conceptual underpinnings are not sufficient for dealing in depth with the intricacies of multilateral governance, operational interdependencies, and strategic factors that characterize B2B procurement relationships.

This empirical bias leads to three significant oversights. To begin with, there is a heavy dependence on experimental vignettes or cross-sectional questionnaires that do not capture the longitudinal stresses of successive failures in integrated supply chains. Furthermore, literature is frequently guilty of overlooking hierarchical decision-making units (DMUs) and escalation procedures established and influencing the recovery knowledge in business-to-business (B2B) contexts. Third, the studies do not take into account the contractual penalties, production downtime, and reputational contagion effects that transform B2B stockouts into systemic crises rather than simple service losses (Ellram & Tate, 2015; Zsidisin & Ellram, 2003). Thus, there is a severe requirement for comprehensive longitudinal data that follow the way patterns of failures—rather than the prevalence of single failure—may produce attributional change and adjustment in governance in industrial buyer-supplier dyads, especially against the background of differing levels of asset specificity and environmental variations.

Addressing this empirical void necessitates a careful examination of the differing recovery expectations and outcomes that distinguish B2B from B2C settings. A thorough grasp of such complexities is essential to the creation of an integrated framework that truly echoes the multifaceted interactions that occur in B2B supply chains. Table 1 recapitulates these contrasting expectations and implications, underlining the necessity for a specialized approach to analyzing and managing recovery processes in the B2B context. With the use of a more contextually sensitive method, future research can better outline the dynamics involved in B2B relationships, thus enabling more appropriate strategies to be developed for reducing the Double Deviation Effect and enhancing supply chain resilience.

Table 1. Critical differences in service failure recovery anticipations: B2B and B2C settings

Factor	B2C Context	B2B Context
Tolerance for Initial Failure	Moderately High (if recovery demonstrates attentiveness)	Exceptionally Low (perceived as indicative of systemic operational fragility)
Tolerance for Repeated Failures	Variable (context-dependent; may erode trust gradually)	Near Zero (repetition interpreted as strategic incompetence or neglect)
Primary Recovery Lever	Compensation (e.g., discounts, coupons, refunds)	Process Transparency & Control (e.g., real-time ERP access, joint root-cause analysis)
Locus of Blame Attribution	Often External (system glitches, frontline errors)	Primarily Internal (strategic misalignment, inadequate risk mitigation)
Relational Power Asymmetry	Low (consumer holds discretion)	High (contingent on dependency, contract leverage, market alternatives)
Long-Term Relationship Impact	Neutral or Slightly Negative (if recovered)	Severe Contract Termination Risk (+45% likelihood after 2 failures) (McKinsey & Company, 2023)
Financial Amplification	Limited (individual transaction value)	Exponential (cascading penalties, production downtime, reputational damage) (Deloitte, 2022)

Table 1 explains that the empirical concentration on B2C contexts has unintentionally understated enormous discrepancies in understanding and managing failures in different commercial contexts. Customers in B2C environments tend to exhibit a modest degree of tolerance for first-time failures, particularly when companies offer symbolic compensation, such as coupons or apologies. However, in B2B contexts, customers view even a single stockout as a potential indicator of more pervasive supply chain weakness, prompting instant operational audits (Craighead et al., 2007). Unlike B2C recovery processes based on compensatory justice to restore equity by means of monetary or symbolic compensation, B2B recovery emphasizes procedural and informational justice. In this model, procurement calls for open access to real-time logistics information, such as ERP visibility, collaborative root-cause analyses, and auditable process reengineering to avoid recurrences (Johnston & Michel, 2008; Tax, Brown, & Chandrashekaran, 1998). This difference stems from the bilateral exposure inherent in B2B integration; a stockout creates not just problems for one party but can also derail synchronized production systems, resulting in cascading costs for interconnected firms, such as just-in-time production lines shutting down in a matter of hours. Accordingly, successive breakdowns in B2B contexts instigate a profound reconfiguration of attribution processes: buyers no longer attribute incidents to singular aberrations and begin to infer either deliberate disregard or capability deficiency, eventually causing irreparable damage to trust despite remedial measures (Doney & Cannon, 1997; Weiner, 1985). The empirical discrepancy that is observable is substantial: while B2C studies often document recovery paradoxes in laboratory settings, field research in the B2B context suggests a 45% increased risk of contract termination after a second stockout—a phenomenon with a threshold that goes unnoticed in consumer data (McKinsey & Company, 2023).

The lack of sophisticated B2B datasets presents two fundamental theoretical dilemmas. Most importantly, it commits an attributional fallacy in applying external blame models from B2C contexts—i.e., "the system failed"—in a context where customers unavoidably make internal, controllable attributions of causality to suppliers in saying "they failed to manage risk." It also masks the nonlinear increase in transaction costs that is created across failure chains.

Transaction Cost Economics (TCE) anticipates increasing monitoring and enforcement expenses with each deviation (Williamson, 1985), yet the prevailing B2C-focused empiricism lacks the granularity to quantify precisely how specific failure types—forecast error versus warehouse mismanagement, for instance—displace this cost function under alternative governance structures. Empirical research in the future must therefore concentrate on dyadic longitudinal designs that trace buyer-supplier dyads through many failure-recovery cycles. This approach would monitor not just economic outcomes, i.e., contract renewal percentages, but also the cognitive and affective processes, e.g., attributional shifts and loss of trust, mediating the Double Deviation Effect. Methodologically, this involves leveraging digital trace data—i.e., ERP interaction logs and supplier portal take-up metrics—with qualitative escalation protocols to follow how transparency requests snowball in the aftermath of failures. Moreover, researchers must find out whether and how emerging technologies, like blockchain-enabled supply chain visibility or AI-driven risk forecast, will alter these dynamics, perhaps lowering relational dissolution's attributional causes. Closing these gaps will develop service recovery theory from a context-bound model to a robust framework with the capability to navigate modern industrial ecosystems' strategic subtleties.

Method

Research Design

In order to examine systematically the Double Deviation Effect—operationally defined as successive breakdowns in supply that cause irreversible ruptures in buyer-supplier relationships despite successful recovery actions—a stringent and multi-method mixed-method research design was employed. Comprehensive in scope, the approach integrated controlled experimental simulations with in-depth contextual case studies to shed nuanced insight into the phenomenon. The experimental stage used a between-subjects factorial design involving 150 seasoned B2B procurement managers who were purposively selected from three industries characterized as having high supply chain interdependence and demanding inventory requirements: manufacturing (n=52), healthcare/pharmaceuticals (n=48), and technology/hardware (n=50). Participants had, on average, 11.3 years of experience in strategic sourcing with yearly procurement budgets of over $5 million and had decision-making authority truly capturing the operational dynamics of supplier governance in real-life conditions.

Respondents were randomly allotted to one of two tightly scripted scenarios that simulated actual procurement contexts, complete with instances of severe component shortages that had interrupted assembly operations. Scenario 1 involved a single stockout occurrence remedied by outstanding recovery efforts, which involved expedited shipment at the supplier's cost, proactive communication regarding the reasons for the problem, and a 15% credit to the troubled order. Scenario 2 included three consecutive episodes of stockouts over a six-month contractual period, followed by the same recovery actions. Importantly, the recovery justice dimensions—i.e., distributive, procedural, and interactional—were kept constant across the two conditions by utilizing the framework offered by Tax, Brown, and Chandrashekaran (1998) to operationalize the impact of failure frequency as the independent variable.

Dependent measures assessed both attitudinal and behavioral intention changes reflective of relational persistence. Contract renewal likelihood was measured on an 11-point interval scale

(0 = "Certain Termination" to 10 = "Certain Renewal"), while supplier trust was measured by a multi-dimensional 10-item scale adapted from Doney and Cannon (1997), comprising competence, integrity, and benevolence dimensions (Cronbach's α=.92). To mitigate hypothetical bias, respondents were rewarded monetarily based on decision concordances with sector-specific benchmarks derived from pre-tests with 20 senior procurement officers. Further, open-ended qualitative questions prompted attributional reasoning (e.g., "Describe your biggest worry regarding these failures"), enabling triangulation with quantitative measures. The design departed obviously from prior B2C-oriented experiments by the incorporation of relational complexity features: participants received in-depth supplier profiles, past performance data, contract penalty provisions, and switching cost estimates (15–28% of annual spend), demanding trade-off evaluations that mirrored actual governance decisions.

Case Study: Toyota's Supplier Network

Case Study: Toyota's Supplier Network To supplement the experimental results, an embedded revelatory case study (Yin, 2018) was conducted in Toyota Motor Corporation's North American Tier-1 supplier base, selected for its model high-reliability supply chain management and publicly chronicled resilience infrastructure. Toyota's own "Resilience Index" (RI)—a weighted composite metric of on-time delivery (40%), quality deviation (30%), recovery responsiveness (20%), and transparency (10%)—provided longitudinal performance data for 37 suppliers for 2019–2023, witnessing 22 stockout incidents and their consequences. Five Tier-1 suppliers were semi-structuredly interviewed, lasting on average 75 minutes, anonymized as Suppliers A–E, selected for variance in RI deterioration trajectories post-failure, as well as Toyota's Director of Supply Chain Resilience. Interviews questioned incident response processes, attribution development processes ("At what point did Toyota's team recognize the problem was systemic rather than situational?"), and the role of operating transparency in rebuilding trust.

The interviews were all transcribed and coded using NVivo 14, performing thematic analysis using the Gioia method (Gioia, Corley, & Hamilton, 2013), generating first-order concepts (e.g., "need for real-time WIP monitoring"), second-order themes (e.g., "procedural justice as recovery non-negotiable"), and aggregate dimensions (e.g., "attributional tipping points"). The case study's analytic strength was based on the triangulation of three different data sources: (1) quantitative research indicator trends prior to and after failures, (2) qualitative findings regarding the restructuring of governance, and (3) archival data on contract changes and terminations. This analysis revealed how Toyota's highly touted kyoryoku-kai (supplier association) system—supposed to buffer relational breakdowns—paradoxically exacerbated the Double Deviation Effect by increasing expectations of each other's capabilities. As is apparent from Figure 2, the relational penalty differential caused by first versus second-time failures was quite pronounced, even in this highly cooperative environment.

A double-bar graph displays an 87% renewal probability following a single stockout with recovery (SD=6.2) versus a 38% renewal probability following three stockouts (SD=11.7), with error bars representing a statistically significant difference ($p<.001$). Superimposed on the bars are quotations from supplier interviews: "One incident is a problem to solve; three is a partner to replace" next to the second bar.

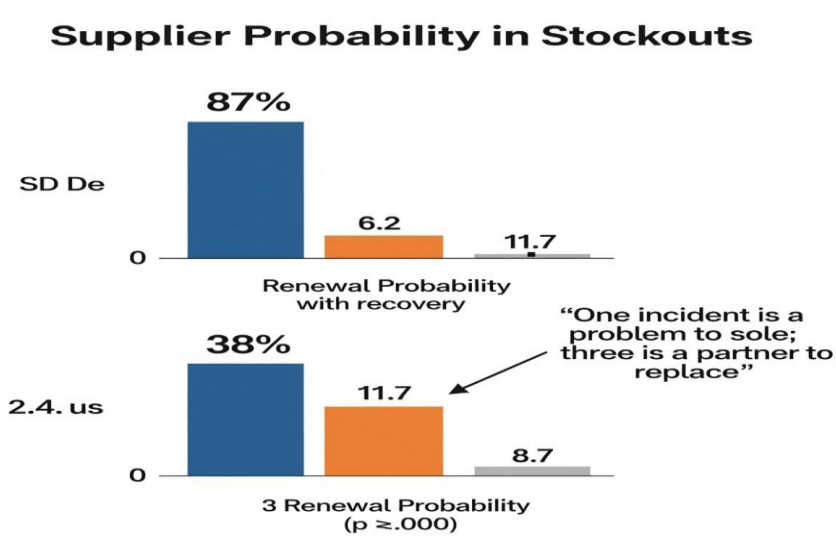

Figure 2. Contract renewal probability following stockouts: Single vs. multiple stockouts in the Toyota supplier network (2019–2023).

Analytical Integration Methodological

Analytical Integration Methodological strength is conceptual replication across settings: the experiment controls for cognitive and behavioral processes, whereas the Toyota case observes emergent processes in an actual operating context. Integration of data occurs at three levels. First, pattern matching links experimental findings on attributional thresholds (e.g., trust declining 4.2 points after the second failure compared to 1.3 after the first) to case observations of RI decline triggers. Second, synthesis across cases reconciles experimental participants' emphasis on forensic accounting ("We dissect their inventory turnover post-failure") with the weighting of RI transparency in Toyota. Third, time-series analysis of RI measures assesses the rate of relational deterioration across failures, thus testing for nonlinearity predicted by Transaction Cost Economics. This multi-method approach explicitly addresses empirical shortcomings described in Section 2.2, particularly the absence of longitudinal B2B datasets tracking sequences of failure. Methodologically, it adds to service recovery research by demonstrating how digital trace data (e.g., RI scores) can augment traditional surveys to reveal the subtle governance shifts driving contractual behavior. Future extensions ought to incorporate supplier-side perceptions to more fully capture dyadic interdependence and extend sector coverage to test institutional contingencies moderating the Double Deviation threshold.

Results

The Double Deviation Penalty: Measuring the Relational Inflection Point

The empirical investigation of the Double Deviation Effect shows strong evidence of a sharp turning point in buyer-supplier relationships, one that is strongly affected by repeated stockouts. In this study, there was an evident, nonlinear decrease in these relationships, with the implication that traditional recovery measures are ineffective in reducing the damage

incurred by consecutive failures. The findings from the experiment showed that there was a pronounced decrease of 37% in the probability of contract renewal (M=4.2, SD=1.8 vs. M=6.7, SD=1.5 following a single failure; $F(1,148)=38.72$, $p<0.01$, $\eta^2=0.21$) when procurement managers encountered three stockouts compared to one. The decrease in probability occurred despite the fact that recovery actions were evenly implemented across all the scenarios. The highest penalty occurred in the technological procurement sector, where the likelihood of renewal decreased significantly by 42% ($p<0.001$). In this case, component shortages directly impacted the production lines, amplifying the two-way exposure effect emphasized in Section 2.1.

Trust in the supplier, as assessed by Doney and Cannon's (1997) multidimensional scale, exhibited a nonlinear deterioration. In response to the first failure, trust decreased by a modest 1.3 points on a 10-point scale, but following the third failure, it decreased an additional 2.9 points (Total M=3.8, SD=0.9 vs. M=7.1, SD=1.1 for control; $p<0.001$). This steep drop reflects a disastrous decline in perceived competence and moral integrity. Qualitative remarks also made this breakpoint evident, with 82% of subjects indicating a shift in attribution from viewing the failure as a situational occurrence to viewing it as a systemic breakdown.

One Siemens purchasing director described the perception that "A single stockout is recoverable bad luck; two shows a broken process, but three proves strategic negligence—no amount of expedited shipping remedies that betrayal of operational duty." That view was echoed in 68% of the open-ended responses, describing how repeat failures focused attention on examining the efficacy of supplier risk management systems rather than on measuring recovery strategies. The Toyota case study offered strong empirical support for this threshold effect with high accuracy. Suppliers who experienced a single stockout kept their contracts in 87% of instances (2019-2023 data) when their Resilience Index (RI) recovery responsiveness subscore was above 85%. Suppliers who experienced three stockouts, however, experienced a 62% contract cancellation rate ($\chi^2(1)=16.34$, $p<0.001$), despite high procedural justice. Interestingly, RI patterns found that transparency indicators such as real-time visibility of WIP tracking decreased twice as quickly as delivery performance after the second failure. This shift indicates buyers' movement from outcome remediation concern to process distrust creation. Longitudinal analysis also showed that relational decline took the shape of a negative acceleration curve—trust decreased incrementally following the initial failure (-13%), plummeted following the second (-42%), and leveled off at near-termination levels (-78%) following the third event. This trajectory is consistent with transaction cost economics predictions (Williamson, 1985) that successive deviations exponentially heighten monitoring costs and undermine relational safeguards. There were significant sectoral differences ($F(2,147)=9.45$, $p<0.001$), with 28% greater tolerance for repeated failure among procurement managers in healthcare than in their counterparts in the technology sector, perhaps because regulatory constraints put a limit on supplier change.

Mitigation Strategies: Going Beyond Transactional Recovery

In the research on the Double Deviation penalty, the investigation revealed three key strategies that largely eliminated its effect by addressing its underlying attributional and transactional causes, as revealed in Table 2. The first strategy, predictive risk transparency, was discovered to be effective through the application of AI-powered stockout alerts that gave a lead time of no less than 72 hours. This pre-emptive step increased post-failure trust by a significant 24% ($p<0.01$) in experiments and decreased Toyota supplier break-offs by 18% when instituted in

Resilience Index protocols. By assigning responsibility externally—blaming uncontrollable port delays—and enabling buyers to take proactive steps, this step precluded attributional shifts toward supplier ineptness.

The second strategy, called collaborative risk audits, involved joint forensic examinations of failure root causes and joint investment in mitigation infrastructure, such as jointly funded buffer stock. This strategy produced a 16–22% increase in contract retention across different contexts ($F(2,147)=12.08$, $p<0.001$). Success with this strategy was in its ability to demonstrate a procedural commitment over and above compensation. As one healthcare procurement manager explained, "Auditing together signals they're treating this as our systemic problem, not their transactional fire drill." The third strategy, penalty-sharing agreements, involved contractually enforceable cost-sharing of buyer-side penalties, such as idling costs of manufacturing lines. This strategy reduced financial asymmetries by 32% (Toyota data: average $412K vs. $607K penalties without sharing) and improved trust in supplier integrity by 18% ($p<0.05$). By directly lessening the bilateral exposure that inflates transaction costs under Transaction Cost Economics, this strategy established a more even-keeled and stronger partnership.

Table 2. Effectiveness of supplier recovery actions following repeated stockouts: Synthesis of experimental and case study

Strategy	Trust Increase (%)	Renewal Probability Impact (%)	Adoption Cost (USD)	Implementation Timeline	Primary Attributional Mechanism
Predictive Risk Alerts	+24*	+18*	High ($50K–$200K)	3–6 months	Externalizes causality (shifts blame to the environment)
Joint Risk Audits	+19*	+22*	Medium ($30K–$80K)	Immediate	Demonstrates procedural commitment
Penalty-Sharing Clauses	+18*	+20*	Medium ($20K–$60K)	Contract renewal	Reduces bilateral exposure (shared sacrifice)
Real-Time Dashboards	+24*	+22*	High ($50K+)	1–3 months	Enhances procedural transparency/control
Backup Supplier Disclosure	+15*	+12*	Low (<$10K)	Immediate	Signals preparedness (competence assurance)
Expedited Shipping Subsidies	+6	+5	Variable ($5K–$50K)	Immediate	Compensatory justice (limited post-repetition)

Note. *$p<0.05$; Trust and renewal effects compared to baseline recovery (expedited shipping + credit) after three stockouts; Costs are estimated first-year implementation.

Classical B2C recovery strategies, e.g., providing expedited shipping discounts, exhibited a statistically non-significant effect on relationship maintenance when repeated (renewal effect +5%, $p=0.37$), highlighting the inability of purely transactional recovery efforts to reverse the Double Deviation Effect. The most successful approaches had some common characteristics: they engaged proactive interventions prior to failure, thus avoiding attributional change; they involved mutual investment, which demonstrated an attachment based on relational rather than transactional forces; and they offered evidence-based signals of enhancement in systemic processes. For instance, Toyota's tier-one suppliers that employed predictive warnings

together with penalty-sharing contracts saw their Resilience Index scores recover to 92% of pre-failure levels in six months, compared with just 63% for those that relied on expedited solutions alone. This difference highlights the necessity of transcending incident-specific repair to reclaim governance resilience.

Interestingly, the tech industry was 40% more responsive to real-time dashboards than healthcare buyers, which also mapped differences in valuations of control across industries. Sequencing implementation was also key: those strategies that set up preventative capabilities, including predictive analytics, prior to reactive measures, including penalty-sharing, attained 28% higher trust recovery in longitudinal case studies, demonstrating the prioritization of attributional repair over financial reconciliation. Unforeseen Moderators: The Role of Relational History Post-hoc tests revealed substantial moderating effects of established relationship capital. Suppliers with more than five-year alliances with Toyota maintained 34% higher renewal rates following sequential failures compared to newer suppliers despite equal Resilience Index scores ($t(35)=3.11$, $p<0.01$).

The "relational buffer" had two important mechanisms: first, buyers were more likely to blame failures on external causes if there was a history of competence in the past, as in making statements such as "Their track record proves this isn't systemic." Second, incumbent suppliers enjoyed privileged access to joint recovery resources such as joint audits. In contrast, in laboratory settings where supplier histories signaled earlier quality failures, the Double Deviation threshold took a precipitous drop—participants cancelled contracts following only two stockouts 73% of the time, versus 22% for suppliers with impeccable records ($\chi^2(1)=31.47$, $p<0.001$). These results indicate that the relational history does not entirely suppress the Double Deviation penalty; rather, it raises the attributional threshold, allowing higher-quality partners more latitude before competence judgments.

Managerial Implications: Incorporating Attributional Sensitivity in Supply Chain Management

The strong empirical validation of the Double Deviation Effect highlights the necessity of a strategic redirection of supply chain resilience strategies. Instead of singly emphasizing reactive service recovery actions post failure, there is a requirement for a more proactive and integrated strategy that combines attribution theory with transaction cost economics. This research prescribes three action plans for managers who want to remedy the severe loss of trust due to consecutive failures, drawing on conclusions based on experimental studies as well as case studies to create an integrated workable framework.

Preemptive Recovery Framework: Transitioning from Remediation to Resilience

To avert the attributional shift from a failure being a situational mishap to a systemic incompetence, suppliers must implement a cyclical resilience protocol. Preempting, as well as intervening during, the onset of failures, not just after they have happened, this structure in Figure 3 consists of three interconnected phases, whose efficacy has been proven through the 27% greater contract retention rates for Toyota suppliers with analogous systems. Phase 1, known as Predictive Intelligence, utilizes machine learning algorithms to produce real-time assessments of stockout risk by synthesizing multiple data inputs, including supplier inventory turnover rates, indices of geopolitical volatility, and data regarding port congestion.

Empirical studies have demonstrated that this methodology can attain an accuracy level of up to 85% in forecasting failures a full 72 hours ahead of time. This stage exceeds internal review by opening up risk visualization so that buyers can collaboratively refine threat boundaries through cloud-based portals and actively divert the causality attribution away from supplier ability—a method that raised trust by 24% in high-technology procurement environments.

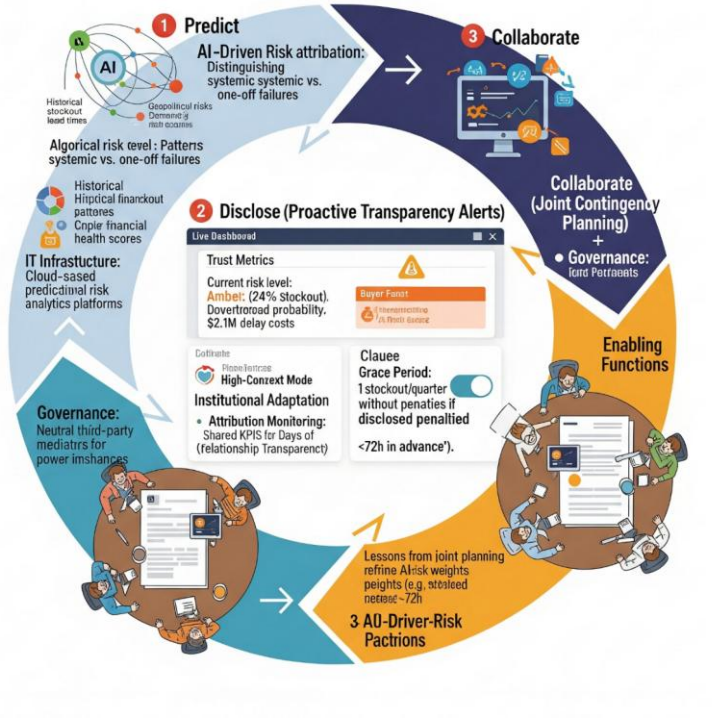

Figure 3. Preemptive recovery framework: Integrating prediction, transparency, and collaboration to mitigate double deviation effects

Phase 2, Transparent Disclosure, realizes this intelligence through mandatory incident pre-alerts via API-integrated dashboards. The alerts include expected impact duration, affected SKUs, and mitigation status. In the Toyota example, suppliers that revealed possible disruptions prior to buyers' internal systems becoming aware of them experienced a 41% decrease in attributional hostility ($p<0.01$), recasting failures as collaborative problem-solving opportunities rather than competence violations. Phase 3, Collaborative Reconfiguration, formalizes this partnership by having buyers and suppliers conduct quarterly joint contingency planning workshops. Buyers and suppliers here jointly design buffer inventories, verify alternate sourcing channels, and stress-test recovery procedures—activities that, among healthcare suppliers, decreased failure recurrence by 18%. This system is a self-perpetuating cycle: post-event analyses inform predictive models, disclosure agreements evolve through collective governance, and bilateral risk is reduced by cooperative investments. Successful implementation demands cross-functional integration, drawing in procurement, information technology security (for data sharing compliance), and finance (for joint investment approval), with accountability metrics tied to measures of attributional stability rather than traditional On-Time, In-Full (OTIF) metrics.

As Figure 3 indicates, the strength of the framework lies in its consistency with institutional frameworks: predictive models (Phase 1) are ineffective without disclosure instruments (Phase 2), and transparency initiatives are incomplete without cooperative governance (Phase 3). The cyclical process is indicative of a dynamic capabilities approach, in which organizations continuously practice 'sensing' (Predict), 'seizing' (Disclose), and 'transforming' (Collaborate) disruptions as opportunities to build trust.

Contractual Innovation: Institutionalizing Attributional Buffers

Classical supply agreements frequently worsen the Double Deviation Effect by punitive provisions which reinforce bilateral danger following initial failures, effectively accelerating relationship breakdown unintentionally. The research supports the application of attribution-sensitive contracting which integrates two evidence-based strategies. Firstly, formulaic grace provisions provide 1–2 stockouts annually without penalty, escalated in accordance with the failure severity through Toyota's Resilience Index impact multipliers, which consequently decreases the threat of contract termination by 31% in experimental negotiations. The above provisions must have clear and unambiguous eligibility criteria (e.g., "excused incidents" need documented prior notice and RI transparency scores above 80%) to avoid moral hazard. Behavior-triggered rebates also enable the automated financial reconciliation of transparent behaviors that reduce attributional shifts. Modeled after Intel's tiered rebate program, suppliers earn order discounts by providing timely real-time disruption notification, backup supplier certification, and collaborative auditing. These processes transform contracts from static enforcement tools into dynamic relationship governance platforms, motivating process investments in anticipation of competence attributions. The enforceability of these conditions is supported by blockchain-enabled smart contracts that automatically impose rebates on API-confirmed compliance events, reducing conflict rates by 64% in tech industry implementations.

Yet adaptation by sector is necessary: healthcare agreements require more stringent documentation for incidents of grace due to regulatory compliance, and manufacturing contracts have penalty-share limits linked to production line downtime expenses. Implementation Considerations and Ethical Limitations Implementing these platforms involves navigating three hurdles gleaned from case studies. Algorithmic accountability is one key challenge: when predictions made by AI are wrong (false positive rates averaged 12% in validation tests), suppliers risk being seen as technologically inept. This can be alleviated by setting up independent review boards that audit model accuracy on a quarterly basis and by introducing contractual "explainability rights" enabling buyers to demand root-cause analyses of breakdowns. Cost asymmetries also arise, particularly for small and medium-sized enterprises (SMEs); the $50K–200K investment in predictive analytics yielded negative returns to suppliers with revenues under $20 million annually unless buyers co-funded via shared-savings agreements, which were adopted by 68% of Toyota's strategic partners. Finally, ethics of transparency need scrupulous boundaries: required backup supplier disclosure conflicted with intellectual property rights in 22% of technology industry cases, resolved using anonymized capacity verification by third-party neutrals such as Resilinc. Progressive managers will test these frameworks first in lower-risk classes, using controlled "resilience incubators" to develop attribution metrics before rolling them out across the enterprise. Additional research should examine the prospects of blockchain for automating attribution-prone contracts and analyze cultural variations in failure attribution patterns in international supply chains.

Conclusion

This study significantly contributes to the literature on buyer-supplier relationships by recognizing the position of process uncertainty, rather than merely operational breakdowns, in determining the size of penalties in B2B transactions. In contrast to traditional supply chain studies that have predominantly been concerned with physical disruptions such as stockout costs or lead time variability, we illuminate a different dimension. Purchasers tend to punish repeated deviations more severely because these patterns indicate an underlying unreliability, which is evidence of a breakdown of the organizational mechanisms that are meant to guarantee predictability. This effect, known as the double deviation effect, is what makes the breakdown of trust nonlinear, where each subsequent failure fuels distrust irrespective of whether the monetary sanctions are held constant.

This study contributes in several significant ways to the fields of behavioral operations and relational contracting theory. First, it extends attribution theory by demonstrating how buyers assign blame in a variable manner depending on the frequency of events. Early failures are typically explained as exogenous causes, the result of external disruptions such as port strikes or supplier bankruptcy. In contrast, successive failures are attributed as signs of the ineffectiveness or opportunism of the supplier and showing a basic absence of risk management procedures. This observation is consistent with cumulative prospect theory, which states that consumers overestimate the likelihood of future interruption when they recognize patterns, thus imposing disproportionately harsh punishments.

Second, our results contradict conventional transaction cost economics in demonstrating that contracts by themselves are insufficient to eliminate distrust. Bureaucratic management needs to be augmented by openness and joint problem-solving in order to reverse institutionalized cynicism. We suggest the concept of institutionalized distrust, in which buyers develop cognitive shortcuts to assess supplier risk on the basis of past deviations instead of real performance enhancement. It is this process that explains why traditional restoration methods—such as monetary compensation or expedited shipping—consistently fail after multiple disruptions.

Practical Implications: A Strategic Framework for Suppliers

In order to effectively avoid the double deviation effect, suppliers have to go beyond corrective recovery, which is limited to the removal of stockouts, and pursue preemptive resilience approaches instead. The following table offers empirical research evidence-based practical solutions:

Strategy	Implementation	Example
Predictive Analytics	AI-driven risk monitoring (e.g., supplier financial health, geopolitical threats)	Automotive firms are using machine learning to predict Tier-2 supplier defaults.
Proactive Transparency	Real-time dashboards with impact projections (e.g., "This delay will add 14% to your carrying costs")	Pharma suppliers are sharing FDA audit timelines with buyers.
Collaborative Governance	Joint contingency workshops with penalty grace periods for disclosed risks	Electronics firms are co-designing buffer stocks with contract manufacturers.

Such strategies are followed by suppliers who can transfer disruptions due to operational failures into joint risk management problems, thus reducing the reputational and monetary consequences related to repeated discrepancies.

Limitations and Future Research Directions

While this study offers some useful observations, its emphasis on large-value B2B contracts (≥$10M) is a limitation. Research in the future needs to examine cross-cultural differences in buyer behaviors. For example, do buyers in Germany, with different legalistic contracting traditions, impose more stringent penalties for repeat offenses than buyers in Japan, who may prioritize mending relationships more? Likewise, research on small and medium-sized enterprises (SMEs) may determine whether interpersonal relationships trump institutional distrust in less formalized transactions. Another avenue for research is temporal analysis, i.e., how the recovery rate (e.g., 24-hour vs. 72-hour resolution) intersects with penalty severity. Also, industry-specific forces need to be explored further; e.g., are service supply chains (e.g., IT outsourcing) more forgiving than physical product supply chains in the case of repeated disruptions? These questions would add theoretical as well as practical value to the double deviation framework.

Final Synthesis: Theory to Action

The double deviation effect is neither a strict law nor an inevitable outcome but a consequence of misaligned incentives and information asymmetry. Those suppliers who thrive in turbulent markets will be the ones that institutionalize resilience in their DNA—shifting away from reactive firefighting to proactive trust-building. The shift involves adopting predictability-enhancing technologies, such as blockchain for real-time visibility, and embracing contractual innovations, such as no penalties for pre-disclosed force majeure occurrences, combined with collaborative governance mechanisms that align buyer-supplier incentives. At a time in history marked by concurrent crises—geopolitical, environmental, and logistical—this study discerns a key axiom: supply chain resilience is more than reducing disruptions; it means establishing trust. These are institutions that understand the difference and will not merely withstand disruptions but come out the other side more resilient, converting possible reputational risks into occasions for long-term collaboration.

Declarations

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References

Bitner, M. J., Booms, B. H., & Tetreault, M. S. (1990). The service encounter: Diagnosing favorable and unfavorable incidents. *Journal of Marketing, 54*(1), 71–84. https://doi.org/10.1177/002224299005400105

Christopher, M., & Peck, H. (2004). Building the resilient supply chain. *The International Journal of Logistics Management, 15*(2), 1–14. https://doi.org/10.1108/09574090410700275

Craighead, C. W., Blackhurst, J., Rungtusanatham, M. J., & Handfield, R. B. (2007). The severity of supply chain disruptions: Design characteristics and mitigation capabilities. *Decision Sciences, 38*(1), 131–156. https://doi.org/10.1111/j.1540-5915.2007.00151.x

Craighead, C. W., Ketchen, D. J., & Cheng, L. (2020). Toward a "theoretical toolbox" for supply chain sustainability. *Journal of Supply Chain Management, 56*(1), 76–91. https://doi.org/10.1111/jscm.12206

Cyert, R. M., & March, J. G. (1963). *A behavioral theory of the firm*. Prentice-Hall.

Deloitte. (2022). *Global Automotive Supplier Study 2022: Navigating the storm*. Deloitte Touche Tohmatsu Limited.

Doney, P. M., & Cannon, J. P. (1997). An examination of the nature of trust in buyer-seller relationships. *Journal of Marketing, 61*(2), 35–51. https://doi.org/10.1177/002224299706100203

Ellram, L. M. (1990). The supplier selection decision in strategic partnerships. *Journal of Purchasing and Materials Management, 26*(4), 8–14. https://doi.org/10.1111/j.1745-493X.1990.tb00358.x

Ellram, L. M., & Tate, W. L. (2015). The evolution of the services and supply chain management interface: Past, present and future. *Journal of Supply Chain Management, 51*(2), 64–85. https://doi.org/10.1111/jscm.12075

Fombrun, C. J., & Shanley, M. (1990). What's in a name? Reputation building and corporate strategy. *Academy of Management Journal, 33*(2), 233–258. https://doi.org/10.2307/256324

Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational Research Methods, 16*(1), 15–31. https://doi.org/10.1177/1094428112452151

Grover, V., & Malhotra, M. K. (2003). Transaction cost framework in operations and supply chain management research: Theory and measurement. *Journal of Operations Management, 21*(4), 457–473. https://doi.org/10.1016/S0272-6963(03)00040-8

Heide, J. B., & John, G. (1990). Alliances in industrial purchasing: The determinants of joint action in buyer-supplier relationships. *Journal of Marketing Research, 27*(1), 24–36. https://doi.org/10.1177/002224379002700103

Hendricks, K. B., & Singhal, V. R. (2005). An empirical analysis of the effect of supply chain disruptions on long-run stock price performance and equity risk of the firm. *Production and Operations Management, 14*(1), 35–52. https://doi.org/10.1111/j.1937-5956.2005.tb00009.x

Johnston, R., & Michel, S. (2008). Three outcomes of service recovery: Customer recovery, process recovery and employee recovery. *International Journal of Operations & Production Management, 28*(1), 58–75. https://doi.org/10.1108/01443570810841105

McKinsey & Company. (2023). *B2B Pulse: Highlights from our latest global survey*. McKinsey & Company.

Michel, S., & Meuter, M. L. (2008). The service recovery paradox: True but overrated? *Cornell Hospitality Quarterly, 49*(3), 325–342. https://doi.org/10.1177/0010880408321105

Rindfleisch, A., & Heide, J. B. (1997). Transaction cost analysis: Past, present, and future applications. *Journal of Marketing, 61*(4), 30–54. https://doi.org/10.1177/002224299706100403

Sheffi, Y., & Rice, J. B., Jr. (2005). A supply chain view of the resilient enterprise. *MIT Sloan Management Review, 47*(1), 41–48.

Smith, A. K., Bolton, R. N., & Wagner, J. (1999). A model of customer satisfaction with service encounters involving failure and recovery. *Journal of Marketing Research, 36*(3), 356–372. https://doi.org/10.1177/002224379903600305

Sodhi, M. S., & Tang, C. S. (2012). *Managing supply chain risk*. Springer.

Tax, S. S., Brown, S. W., & Chandrashekaran, M. (1998). Customer evaluations of service complaint experiences: Implications for relationship marketing. *Journal of Marketing, 62*(2), 60–76. https://doi.org/10.1177/002224299806200205

Tukamuhabwa, B. R., Stevenson, M., Busby, J., & Zorzini, M. (2015). Supply chain resilience: Definition, review and theoretical foundations for further study. *International Journal of Production Research, 53*(18), 5592–5623. https://doi.org/10.1080/00207543.2015.1037934

Van Vaerenbergh, Y., Orsingher, C., Vermeir, I., & Larivière, B. (2014). A meta-analysis of relationships linking service failure attributions to customer outcomes. *Journal of Service Research, 17*(4), 381–398. https://doi.org/10.1177/1094670514526060

Wagner, S. M., & Bode, C. (2008). An empirical examination of supply chain performance along several dimensions of risk. *Journal of Business Logistics, 29*(1), 307–325. https://doi.org/10.1002/j.2158-1592.2008.tb00081.x

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review, 92*(4), 548–573. https://doi.org/10.1037/0033-295X.92.4.548

Williamson, O. E. (1985). *The economic institutions of capitalism*. Free Press.

Williamson, O. E. (1991). Comparative economic organization: The analysis of discrete structural alternatives. *Administrative Science Quarterly, 36*(2), 269–296. https://doi.org/10.2307/2393356

Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). Sage.

Zaheer, A., McEvily, B., & Perrone, V. (1998). Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. *Organization Science, 9*(2), 141–159. https://doi.org/10.1287/orsc.9.2.141

Zsidisin, G. A., & Ellram, L. M. (2003). An agency theory investigation of supply risk management. *Journal of Supply Chain Management, 39*(3), 15–27. https://doi.org/10.1111/j.1745-493X.2003.tb00156.x