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Organizational Resilience under Continuous Disruption: Lessons from AI, Climate Risks, and Global Supply Chains

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ABSTRACT

Organizations no longer face disruption as an occasional event that interrupts an otherwise stable operating environment. Artificial intelligence adoption, climate-related shocks, geopolitical fragmentation, cyber threats, and volatile supply chains now arrive together and often reinforce one another, which means resilience has to be understood as a continuous organizational condition rather than a response reserved for isolated crises. This paper reviews the evolution of organizational resilience research and develops an integrated conceptual framework that links five capability-based antecedents, namely AI capability, climate risk preparedness, supply chain resilience, digital transformation capability, and organizational learning, to resilience outcomes through four mediating mechanisms: organizational agility, dynamic capabilities, knowledge integration, and adaptive leadership. Environmental uncertainty, organizational culture, and technological readiness are proposed as moderators that condition the strength of these relationships. The framework draws on dynamic capabilities theory, organizational resilience theory, the resource-based view, contingency theory, complexity theory, high reliability organization theory, organizational learning theory, stakeholder theory, systems theory, and risk management theory, and it treats these traditions as complementary rather than competing explanations. Twelve testable propositions are advanced to connect the constructs, and a methodology is proposed using partial least squares structural equation modeling on a cross-industry sample of managers responsible for risk, operations, or strategy. The paper argues that resilience in the current environment depends less on any single capability and more on how firms sense weak signals across domains, integrate what they learn, and reconfigure resources before disruptions compound. It closes by identifying research priorities in AI governance, climate adaptation, digital supply chain design, and human-AI collaboration, and by offering guidance for managers and policymakers who are trying to build organizations that can absorb shocks without losing strategic direction.

Keywords: Organizational resilience, dynamic capabilities, artificial intelligence, climate risk, supply chain resilience, organizational agility, business continuity, sustainable performance

INTRODUCTION

For most of the twentieth century, management scholars treated disruption as an exception to be managed through contingency planning, insurance, and recovery procedures. That assumption no longer holds. Firms today operate inside an environment where artificial intelligence is reshaping decision processes and workforce structures, where climate-related events are damaging physical assets and disrupting logistics networks with increasing frequency, and where geopolitical realignment and cyber intrusion have become ordinary features of the operating landscape rather than rare intrusions into it. The COVID-19 pandemic demonstrated how quickly a single shock can cascade through interconnected supply networks, and the years since have shown that such cascades are not a one-time event but a recurring pattern (Ivanov &

Dolgui, 2020). Firms that treat each disruption as a discrete incident, to be handled and then filed away, are structurally unprepared for an environment in which the next disruption is already forming before the last one has been resolved.

This paper works from the premise that organizational resilience needs to be reconceived as a continuous capability rather than a contingency reserve. Linnenluecke (2017) showed that resilience research has developed along at least five separate lines of inquiry, including responses to external threats, organizational reliability, employee strengths, business model adaptability, and reduced supply chain vulnerability, and that these streams rarely speak to one another. Duchek (2020) took a step toward integration by treating resilience as a meta-capability composed of anticipation, coping, and adaptation, but her framework was developed before AI adoption, climate volatility, and supply chain fragility became simultaneous and interacting pressures on the same firm. The task this paper takes on is to extend that capability-based view into a setting where multiple disruption sources operate at once, and to explain how firms build the underlying capacity to sense, respond to, and learn from disruption regardless of its source.

The paper is organized as follows. Section two reviews the literature on organizational resilience and on the specific disruption sources under study. Section three identifies the research gap that motivates an integrated approach. Sections four and five state the research objectives and questions. Section six sets out the theoretical foundations drawn from ten complementary management theories. Section seven presents the conceptual framework linking independent, mediating, moderating, and dependent constructs. Section eight develops twelve propositions. Section nine proposes a methodology for empirical testing using PLS-SEM. Section ten offers a critical discussion of specific practice areas, including AI-enabled resilience, climate adaptation, cyber resilience, and supply chain redesign. The paper closes with its contributions and an agenda for future research.

LITERATURE REVIEW

The evolving concept of organizational resilience

Organizational resilience entered management scholarship later than it entered engineering, ecology, and psychology, where the term originally described a system's capacity to absorb disturbance and retain its basic structure and function. Linnenluecke's (2017) review of 339 publications spanning nearly four decades found that business and management research on resilience had fragmented into separate streams that rarely cited one another, a pattern that left the field without a shared definition or a cumulative body of findings. Some studies treat resilience as an outcome, visible only after a firm has weathered a shock and returned to, or exceeded, its prior performance. Others treat it as a process unfolding over time, and a third group treats it as a bundle of underlying capabilities that a firm can build in advance of any specific threat.

Duchek (2020) advanced the capability-based view by proposing that resilience unfolds across three stages: anticipation, which involves the ability to observe developments and identify potential threats before they materialize; coping, which involves accepting a situation, developing solutions, and implementing them; and adaptation, which involves reflecting on the experience and drawing lessons that change the organization going forward. Lengnick-Hall, Beck, and Lengnick-Hall (2011) had earlier argued that resilience capacity depends heavily on human resource practices that build cognitive, behavioral, and contextual readiness among employees, since it is people who notice anomalies, improvise responses, and carry institutional memory of past disruptions forward. Duchek, Raetze, and Scheuch (2020) extended this line further by showing that workforce diversity itself can support or hinder resilience depending on how well an organization manages the tensions that diverse perspectives introduce. More recently, Hillmann (2021) synthesized the resilience literature by organizing it around disciplines and critiques, concluding that the field still lacks agreement on whether resilience is best measured as a trait, a state, or a trajectory, and Conz and Magnani (2020) proposed treating firm resilience as a process unfolding in time rather than a fixed attribute, a reframing that fits naturally with the continuous disruption environment this paper addresses.

A separate stream of resilience research grew out of the study of high reliability organizations, meaning institutions such as aircraft carriers, nuclear plants, and emergency departments that operate with very low tolerance for failure. Weick and Sutcliffe (2001) argued that such organizations sustain performance under pressure not through rigid planning but through a set of five habits of mind: preoccupation with failure, reluctance to simplify interpretations, sensitivity to operations, commitment to resilience itself, and deference to expertise wherever it resides in the hierarchy. Perrow's (1984) earlier and more pessimistic account of complex, tightly coupled systems argued that accidents in such systems are in some sense normal and unavoidable, a claim that has since been used to justify redundancy and slack as deliberate resilience investments rather than as waste to be eliminated.

Artificial intelligence and organizational adaptability

The relationship between artificial intelligence and organizational resilience runs in two directions at once. On one hand, AI systems can strengthen a firm's capacity to sense disruption early, since machine learning models can process volumes of operational, market, and environmental data well beyond what human analysts can review in the same period, and can flag anomalies that would otherwise surface only after damage has occurred (ISACA, 2025). On the other hand, AI adoption introduces its own category of organizational risk. Recent regulatory activity illustrates this second point directly. The European Union's Digital Operational Resilience Act requires firms in the financial sector to build information and communication technology risk management frameworks that explicitly cover AI systems and the third parties that supply them, and comparable obligations are emerging in the United Kingdom, where the Bank of England, the Prudential Regulation Authority, and the Financial Conduct Authority have jointly developed a regime for designating critical third parties whose failure could threaten financial stability. Voluntary standards such as ISO/IEC 42001 and the United States National Institute of Standards and Technology's AI Risk Management Framework have emerged alongside these binding rules, organizing AI governance around the functions of governing, mapping, measuring, and managing risk.

Within supply chain management specifically, a growing body of work treats AI-enabled predictive analytics as a resilience-strengthening capability, since forecasting models can anticipate supplier disruption, demand shifts, and logistics bottlenecks earlier than manual monitoring allows. Systematic reviews of this literature note that AI techniques are increasingly used across the full supply chain risk assessment cycle, from identification through mitigation, though the evidence base remains uneven across industries and the practical implementation gap between what AI can technically do and what firms have actually deployed remains wide. KPMG's assessment of the 2026 operating environment observes that AI is moving from an experimental initiative toward a core operating asset inside many firms, and that this same embedding process is what turns AI systems into a new category of organizational dependency, since a firm that relies on AI for sensing and decision support inherits new exposure if those systems are manipulated, degraded, or simply wrong with confidence. The practical implication is that AI capability cannot be treated purely as a resilience input. It needs to be paired with governance mechanisms that treat AI systems themselves as assets requiring protection and oversight, a point developed further in the discussion section of this paper.

Climate risk and organizational performance

Physical climate risk has moved from a peripheral sustainability concern to a mainstream item on the strategic agenda. Li (2025) examined how publicly traded firms respond to forecasted physical climate exposure and found that firms adapt more, and more completely, when the exposure is salient to their specific operations, and that this relationship is stronger among firms with more developed environmental, social, and governance capabilities and longer strategic time horizons. This finding matters for resilience theory because it suggests that climate adaptation is not simply a function of exposure severity. It depends on organizational capacity to interpret exposure correctly and to act on a horizon long enough to justify the investment. Hennes, Bendig, and Löschel (2024) reached a similar conclusion in their systematic review of corporate climate adaptation research, which drew on 66 studies to build a typology of corporate climate adaptation and resilience strategies, noting that climate hazards had already produced losses of roughly fifty-two billion euros across the European Union in a single year and that research synthesizing what actually works for firms remains thin relative to the scale of the exposure.

Ratings agencies have reached parallel conclusions from a different angle. S&P Global's review of corporate sustainability disclosures found that action on climate adaptation remains at an early stage for most companies, leaving many firms underprepared for worsening physical hazards even as the frequency of billion-dollar climate disasters has risen sharply over the past four decades. Taken together, this literature suggests that climate risk preparedness functions less like a stand-alone risk category and more like a test of whether a firm's existing resilience capabilities, its sensing systems, its planning horizon, and its governance structures, are calibrated to a threat that unfolds over years rather than days.

Supply chain resilience and viability

Supply chain resilience research expanded rapidly after the COVID-19 pandemic exposed how thinly buffered many global supply networks had become. Sheffi and Rice (2005) had anticipated much of this discussion two decades earlier, arguing that firms achieve resilience through some combination of redundancy, meaning reserved capacity held in case of disruption, and flexibility, meaning the organic capability to sense threats and respond to them quickly, and that flexibility tends to produce a more durable competitive advantage than redundancy because it strengthens the organization rather than simply insuring it. Ivanov and Dolgui (2020) extended this thinking by proposing the concept of supply chain viability, arguing that resilience alone, understood as the ability to recover from a single disruption, is insufficient in an environment of prolonged and overlapping crises, and that firms instead need to manage intertwined supply networks as adaptive systems capable of surviving structural change rather than simply bouncing back to a prior state.

This viability perspective has practical implications for the debate between nearshoring, reshoring, and continued globalization of supply. Firms that concentrate supply in geographically distant, low-cost locations gain efficiency but accept a form of structural fragility that becomes visible only when a shock interrupts transportation or production. Firms that diversify across multiple tiers and geographies gain resilience but absorb higher steady-state costs. The literature does not offer a universal answer to this tradeoff, and the methodology proposed later in this paper treats supply chain resilience as a construct to be measured empirically across firms rather than assumed in either direction.

Digital transformation, organizational learning, and agility

Digital transformation capability and organizational learning function as general-purpose enablers that cut across the AI, climate, and supply chain domains rather than sitting alongside them as separate risk categories. Vial (2019), reviewing 282 studies, proposed that digital transformation unfolds as digital technologies create disruptions that trigger strategic responses, and that firms need to manage the structural changes and organizational barriers that determine whether the process produces value or simply produces disruption without benefit. This framing is directly relevant to resilience research because it treats digital capability not as a fixed asset but as an ongoing organizational process that firms must continually renew, which aligns closely with the dynamic capabilities tradition discussed in section six.

Organizational learning theory offers a complementary lens. Argyris and Schön (1978) distinguished between single-loop learning, in which an organization corrects an action without questioning the assumptions that produced the error, and double-loop learning, in which the organization revisits and revises the governing values and beliefs behind its actions. Firms that only engage in single-loop learning after a disruption may fix the immediate symptom, restoring a supplier relationship or patching a security gap, without addressing the underlying assumption, for instance an unexamined belief that a single supplier or a single data source was reliable enough not to require redundancy. Resilience in a continuous disruption environment depends on an organization's capacity for the double-loop variety of learning, since only that deeper form of reflection changes the conditions that produced the vulnerability in the first place.

RESEARCH GAP

Three gaps in the existing literature motivate this study. First, the resilience literature remains fragmented across disciplinary streams that examine specific disruption sources in isolation. Studies of AI risk, climate adaptation, and supply chain resilience have each matured into substantial bodies of work, but they rarely connect to one another or to the broader organizational resilience literature that Linnenluecke (2017) and Duchek (2020) helped establish. A firm exposed simultaneously to AI-related operational risk, climate-related asset risk, and supply chain fragility needs a single integrated account of what builds resilience across all three, not three separate literatures that each assume the others are held constant.

Second, existing capability-based models of resilience, including Duchek's influential anticipation-coping-adaptation sequence, were developed to explain how firms respond to discrete crisis events. They are less well suited to an environment in which disruptions from multiple sources arrive concurrently and interact, so that a climate event might trigger a supply disruption that is then compounded by an AI system trained on historical patterns that no longer hold. The mediating role of dynamic capabilities, agility, knowledge integration, and adaptive leadership under conditions of simultaneous, cross-domain disruption has not been systematically modeled.

Third, the methodological literature on resilience remains heavily descriptive and case-based. Rigorous, quantitatively validated models linking specific antecedent capabilities to resilience outcomes through clearly specified mediating and moderating mechanisms are comparatively rare, which limits the field's ability to test competing explanations against one another or to give managers evidence-based guidance about where to invest scarce resilience-building resources. This paper responds to these three gaps by proposing an integrated framework and a methodology capable of testing it empirically.

RESEARCH OBJECTIVES

This paper pursues six objectives. It reviews recent developments in organizational resilience research to establish a common baseline across previously separate streams. It analyzes how AI adoption affects organizational adaptability, treating AI simultaneously as a resilience-enabling capability and a source of new organizational risk. It examines climate-related risks and their effect on organizational performance, with attention to the conditions under which firms adapt effectively. It evaluates global supply chain disruption and the strategies firms use to build resilience without sacrificing operating efficiency. It develops an integrated conceptual framework linking capability-based antecedents to resilience outcomes through specified mediating and moderating mechanisms. It offers practical recommendations for managers and policymakers responsible for building organizational resilience under conditions of continuous, multi-source disruption.

RESEARCH QUESTIONS

1. How has the concept of organizational resilience evolved in the era of continuous disruption?

2. What organizational capabilities enable firms to withstand simultaneous technological, environmental, and geopolitical disruptions?
3. How can AI strengthen organizational resilience while introducing new organizational risks?
4. What role does leadership play in building resilient organizations?
5. How should organizations redesign supply chains to improve resilience without sacrificing efficiency?
6. Which governance mechanisms support long-term organizational adaptability?

THEORETICAL FOUNDATIONS

This paper integrates ten theoretical traditions rather than adopting a single lens, on the argument that continuous, multi-source disruption is too complex a phenomenon to explain through any one theory alone.

Dynamic capabilities theory

Dynamic capabilities theory, developed by Teece, Pisano, and Shuen (1997) and elaborated by Teece (2007), defines dynamic capability as a firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments. Teece (2007) organized this ability into three microfoundational processes: sensing opportunities and threats, seizing them through resource commitment and strategic action, and transforming the firm's asset base to remain aligned with a changing environment. This framework was developed partly as a response to the resource-based view's difficulty explaining how firms adapt their resource base over time rather than simply exploiting a fixed set of valuable resources (Eisenhardt & Martin, 2000). In the present framework, dynamic capabilities function as a mediating mechanism, since AI capability, climate preparedness, supply chain resilience, digital transformation capability, and organizational learning are treated as antecedents that build the capacity to sense, seize, and reconfigure, and it is that capacity which then produces resilience outcomes.

Organizational resilience theory

Organizational resilience theory, as synthesized by Linnenluecke (2017) and advanced by Duchek (2020), provides the outcome-side vocabulary for this paper. Duchek's three-stage model of anticipation, coping, and adaptation maps closely onto the mediating constructs proposed here: anticipation depends heavily on agility and knowledge integration, coping depends on adaptive leadership and dynamic capabilities in the moment of crisis, and adaptation depends on organizational learning feeding back into future anticipation.

Resource-based view

Barney's (1991) resource-based view holds that sustained competitive advantage flows from resources that are valuable, rare, imperfectly imitable, and non-substitutable, a framework typically abbreviated VRIN. Applied to resilience, the resource-based view explains why some antecedent capabilities, for instance a proprietary AI-enabled forecasting system tightly integrated with a firm's specific supply network, produce more durable resilience advantages than capabilities that can be purchased off the shelf by competitors. The theory has a well-documented limitation, however, in that it explains why certain resource configurations produce advantage without fully explaining how firms build and rebuild those configurations as the environment changes, which is precisely the gap dynamic capabilities theory was developed to fill.

Contingency theory

Contingency theory, originating with Lawrence and Lorsch (1967), argues that there is no single best way to organize and that effective structure depends on the fit between an organization and the uncertainty of its environment. This paper treats environmental uncertainty as a moderating variable precisely because contingency theory predicts that the strength of the relationship between resilience-building capabilities and resilience outcomes should vary with how volatile and unpredictable the surrounding environment is.

Complexity theory

Complexity theory treats organizations as complex adaptive systems whose behavior emerges from the interaction of many interdependent parts rather than from central control alone. This tradition is particularly relevant to the continuous disruption environment addressed here, since it explains why disruptions from AI, climate, and supply chain sources do not simply add together but interact, sometimes producing effects that are disproportionate to any single triggering event. Perrow's (1984) account of tightly coupled, complex systems, developed within the study of industrial accidents, is one of the clearest statements of this logic and helps explain why redundancy and loose coupling remain relevant design principles even in highly efficient, digitally integrated operations.

High reliability organization theory

High reliability organization theory, developed by Weick and Sutcliffe (2001), explains how organizations operating in unforgiving environments sustain performance through collective mindfulness rather than through planning alone. The five habits of mind identified in that tradition, preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, and deference to expertise, map onto the adaptive leadership construct in the framework proposed below, since each habit depends on leaders who create the conditions for frontline staff to surface problems rather than suppress them.

Organizational learning theory

Argyris and Schön's (1978) distinction between single-loop and double-loop learning, discussed in section two, provides the theoretical basis for treating organizational learning as an antecedent capability that operates partly through knowledge integration and partly through its effect on future anticipation.

Stakeholder theory

Freeman's (1984) stakeholder theory holds that firms create sustained value by managing the interests of the full range of groups that affect or are affected by the organization, not shareholders alone. This tradition is relevant to resilience because many of the disruption sources examined here, climate risk in particular, generate consequences for employees, communities, suppliers, and regulators well beyond shareholders, and a firm's resilience strategy that ignores these wider stakeholder effects risks reputational and regulatory consequences even where operational continuity is maintained.

Systems theory

General systems theory treats the organization as an open system that exchanges resources, information, and energy with its environment and that must maintain internal coherence while adapting to external change. This perspective underlies the framework's treatment of supply chains and digital infrastructure as networks whose resilience depends on the properties of the whole system rather than on any single node, consistent with Ivanov and Dolgui's (2020) argument that firms need to manage intertwined supply networks as adaptive systems.

Risk management theory

Risk management theory contributes the vocabulary of risk identification, assessment, mitigation, and monitoring that underlies the governance mechanisms discussed later in this paper, including the emerging regulatory frameworks for AI risk described in section two. Where classical risk management theory has traditionally treated risks as separable and independently manageable, the framework developed here follows more recent risk scholarship in treating AI, climate, and supply chain risks as interdependent, an assumption that shapes both the conceptual model and the proposed governance recommendations.

CONCEPTUAL FRAMEWORK

The proposed framework links five independent constructs, four mediating constructs, three moderating constructs, and four dependent constructs. The independent constructs are AI capability, climate risk preparedness, supply chain resilience, digital transformation capability, and organizational learning. Each represents a distinct capability domain that a firm can develop, and each has been shown in the literature reviewed above to relate to organizational performance under disruption, though rarely within a single integrated model. The mediating constructs are organizational agility, dynamic capabilities, knowledge integration, and adaptive leadership. These constructs represent the internal processes through which antecedent capabilities are converted into resilience outcomes; a firm can possess strong AI capability, for instance, and still fail to become more resilient if that capability is not translated into faster sensing, better-integrated knowledge, and leadership willing to act on what the AI system reveals.

The moderating constructs are environmental uncertainty, organizational culture, and technological readiness. Consistent with contingency theory, these variables are expected to strengthen or weaken the relationships between antecedents, mediators, and outcomes rather than to have independent direct effects on resilience. A firm with low technological readiness, for example, is likely to see a weaker relationship between AI capability and organizational agility than a firm with high readiness, simply because the underlying infrastructure needed to act on AI-generated insight is not yet in place. The dependent constructs are organizational resilience, business continuity, sustainable organizational performance, and competitive advantage. These four outcomes are treated as related but distinguishable, since a firm can maintain business continuity through a single disruption without necessarily achieving the sustained performance or competitive advantage that follows from a deeper resilience capacity.

The overall logic of the framework can be summarized as follows. Antecedent capabilities (AI capability, climate risk preparedness, supply chain resilience, digital transformation capability, organizational learning) shape mediating processes (organizational agility, dynamic capabilities, knowledge integration, adaptive leadership), which in turn produce dependent outcomes (organizational resilience, business continuity, sustainable organizational performance, competitive advantage). Moderating conditions (environmental uncertainty, organizational culture, technological readiness) condition the strength of the antecedent-to-mediator and mediator-to-outcome relationships throughout the model.

PROPOSITION DEVELOPMENT

P1. AI capability is positively related to organizational agility, because AI-enabled sensing and analysis shorten the time between the emergence of a threat or opportunity and an organization's recognition of it.

P2. AI capability is positively related to organizational resilience, but this relationship is weaker where AI governance mechanisms, including risk oversight and third-party monitoring, are underdeveloped, since immature governance converts AI from a resilience asset into an additional source of operational risk.

P3. Climate risk preparedness is positively related to dynamic capabilities, because firms that invest in monitoring and interpreting climate exposure develop stronger sensing routines that generalize to other slow-moving threats.

P4. Climate risk preparedness is positively related to sustainable organizational performance, and this relationship is stronger among firms with longer strategic planning horizons, consistent with Li's (2025) finding that time horizon conditions the strength of firms' climate adaptation.

P5. Supply chain resilience is positively related to business continuity, because diversified and transparent supply networks reduce the probability that a single point of failure interrupts operations.

P6. Supply chain resilience is positively related to organizational resilience through knowledge integration, because firms with visibility across supply tiers accumulate and integrate information that supports faster and more accurate response decisions.

P7. Digital transformation capability is positively related to organizational agility, consistent with Vial's (2019) argument that digital transformation functions as an ongoing strategic response process rather than a one-time technology adoption.

P8. Organizational learning is positively related to adaptive leadership, because leaders embedded in organizations that practice double-loop learning are more likely to question governing assumptions rather than defend prior decisions when disruption reveals their limits.

P9. Adaptive leadership mediates the relationship between organizational learning and organizational resilience.

P10. Dynamic capabilities mediate the relationships between AI capability, climate risk preparedness, supply chain resilience, and organizational resilience.

P11. Environmental uncertainty positively moderates the relationship between dynamic capabilities and organizational resilience, such that the relationship is stronger under high uncertainty, consistent with contingency theory's prediction that capability investments matter most when the environment is least predictable.

P12. Organizational culture moderates the relationship between adaptive leadership and organizational resilience, such that the relationship is stronger in cultures that tolerate the open reporting of failure, consistent with the high reliability organization tradition's emphasis on preoccupation with failure as a precondition for resilience.

RESEARCH METHODOLOGY

Research philosophy and approach

This study adopts a post-positivist research philosophy, treating organizational resilience as a construct that can be approximated and measured through validated indicators even though it cannot be observed directly in full. A deductive approach is proposed, since the framework and propositions developed above are derived from established theory and are intended to be tested against empirical data rather than generated inductively from it. A cross-sectional survey design is recommended as the primary vehicle for data collection, supplemented where feasible by a smaller set of semi-structured interviews with senior risk and operations executives to provide interpretive depth around the quantitative findings.

Target population and sampling

The target population consists of managers with direct responsibility for risk management, operations, or strategy within firms of at least one hundred employees, operating in sectors with meaningful exposure to at least two of the three disruption domains under study: AI-dependent operations, physical climate exposure, and multi-tier global supply chains. A purposive and stratified sampling technique is recommended, with strata defined by industry sector and firm size, to ensure adequate representation across manufacturing, logistics, financial services, and technology-intensive sectors rather than concentration in any single industry. Given the complexity of the proposed structural model, which includes thirteen latent constructs, a minimum sample size of approximately 300 to 400 usable responses is recommended, consistent with general guidance for PLS-SEM models of this scale (Hair, Hult, Ringle, & Sarstedt, 2022), and the final sample size should be confirmed through a power analysis conducted once the measurement model is finalized.

Data collection and measurement

Data collection should proceed through a structured online questionnaire using established multi-item scales adapted from prior resilience, dynamic capabilities, and supply chain research wherever validated instruments exist, supplemented by newly developed items for constructs, such as AI capability and AI governance maturity, where existing scales have not yet caught up with the pace of technological change. All items should be measured on a seven-point Likert scale to maximize response variance while remaining familiar to respondents accustomed to standard survey formats. A pilot test with 30 to 40 respondents is recommended before full deployment, to identify ambiguous items and confirm face validity with practitioners.

Reliability and validity assessment

Following standard PLS-SEM practice (Hair et al., 2022), the measurement model should be assessed for internal consistency reliability using Cronbach's alpha and composite reliability, both with a recommended threshold above 0.70. Convergent validity should be assessed through average variance extracted, with a threshold above 0.50, and discriminant validity should be assessed using the heterotrait-monotrait ratio of correlations rather than the older Fornell-Larcker criterion alone, given documented concerns about the sensitivity of the latter in models with many constructs. Once the measurement model is confirmed, the structural model should be assessed for collinearity among predictor constructs, path coefficient significance through bootstrapping with at least 5,000 subsamples, and explanatory and predictive power through R-squared and Q-squared statistics respectively.

Analytical strategy

The proposed statistical strategy centers on partial least squares structural equation modeling, chosen over covariance-based SEM because the model is exploratory in parts, involves formative as well as reflective indicators for several constructs, such as supply chain resilience, and prioritizes prediction of resilience outcomes over strict confirmatory model fit. Mediation analysis should follow the bootstrapping approach recommended in the contemporary PLS-SEM literature to test the indirect effects specified in propositions 9 and 10. Moderation analysis should use the two-stage approach to test the interaction effects specified in propositions 11 and 12. Multi-group analysis across industry sectors is recommended as a robustness check, to assess whether the strength of the proposed relationships differs meaningfully between, for instance, manufacturing firms with heavy physical supply chain exposure and financial services firms with heavier AI and cyber exposure.

Ethical considerations

All respondents should provide informed consent prior to participation, be advised of their right to withdraw at any point without consequence, and be assured that individual and organizational responses will be reported only in aggregated and anonymized form. Given that some items concern firms' risk exposure and governance maturity, which could be commercially sensitive, no identifying organizational information should be retained beyond what is necessary for stratification, and the dataset should be stored in accordance with applicable data protection regulation for the duration of the study and no longer.

CRITICAL DISCUSSION

AI-enabled resilience and its governance

The evidence reviewed in this paper supports a dual reading of AI's relationship to organizational resilience. AI systems can shorten detection time for emerging threats and can process signal volumes beyond human analytical capacity, which is consistent with treating AI capability as a resilience-strengthening antecedent in the proposed framework. At the same time, the regulatory response building around AI, from the Digital Operational Resilience Act in the European Union to the NIST AI Risk Management Framework in the United States, reflects a growing recognition that AI systems themselves require the kind of oversight historically reserved for critical infrastructure. The practical implication for managers is that AI adoption decisions should be paired with governance investment from the outset rather than treated as a subsequent compliance step, since the propositions developed above predict that the resilience benefit of AI capability depends on governance maturity rather than arising automatically from the technology itself.

Climate adaptation as a strategic rather than compliance exercise

The climate literature reviewed in section two points toward a consistent conclusion: firms that treat climate adaptation as a compliance exercise, satisfying disclosure requirements without changing underlying operations, are unlikely to build genuine resilience to physical climate exposure. Li's (2025) finding that adaptation strength depends on time horizon and ESG capability suggests that climate resilience is, in practice, a test of an organization's broader strategic maturity rather than a discrete initiative that can be delegated entirely to a sustainability function.

Cyber resilience and organizational agility

Cyber threats sit at the intersection of the AI and digital transformation domains discussed throughout this paper, since the same digital infrastructure that enables AI-driven sensing and automation also expands the attack surface available to adversaries. Organizational agility, understood as the capacity to reconfigure operations quickly in response to a detected threat, functions as the primary mediating mechanism connecting digital and AI capability to cyber resilience specifically, which is consistent with the broader mediating role assigned to agility in the conceptual framework.

Supply chain diversification, nearshoring, and multi-tier visibility

The debate between nearshoring, reshoring, and continued reliance on distant low-cost suppliers cannot be resolved on efficiency grounds alone once resilience is treated as a strategic objective in its own right. Ivanov and Dolgui's (2020) viability concept suggests that the more decision-relevant question is not where suppliers are located but how visible and adaptable the network is as a whole, since a geographically diversified network with poor multi-tier visibility can be just as fragile as a concentrated one. This reframes practical supply chain resilience investment away from a binary geography decision and toward investment in the information systems needed to see and respond to disruption across supplier tiers.

Knowledge management and organizational learning after crisis

The distinction between single-loop and double-loop learning developed by Argyris and Schön (1978) offers a useful diagnostic for practitioners assessing their own organization's post-crisis behavior. A firm that responds to a supply disruption by simply adding a backup supplier has engaged in single-loop learning; a firm that also revisits the assumptions that led it to rely on a single supplier in the first place, and applies that revised assumption to other parts of its operations, has engaged in the double-loop learning that this paper's framework treats as central to sustained resilience.

Sustainable supply chains, circular economy strategies, and ESG considerations

Sustainability and resilience objectives are frequently treated as separate strategic tracks, one oriented toward environmental and social performance and the other toward operational continuity, but the literature reviewed here suggests these tracks converge more than they diverge. Firms with stronger ESG capability were shown to adapt more effectively to climate exposure (Li, 2025), and circular economy practices, which reduce dependence on virgin raw material inputs, plausibly reduce exposure to the same supply disruptions that resilience strategies are designed to address, though this specific link remains an area where more direct empirical testing is needed.

CONTRIBUTIONS

Theoretical contribution

This paper contributes to theory by integrating ten previously separate theoretical traditions into a single framework organized around antecedent capabilities, mediating processes, moderating conditions, and resilience outcomes. This integration responds directly to Linnenluecke's (2017) observation that resilience research remains fragmented across disciplinary streams and offers researchers a shared structure within which studies of AI, climate, and supply chain resilience can be positioned relative to one another rather than developed in isolation.

Managerial contribution

For practitioners, the framework offers a diagnostic structure for identifying where resilience investment is likely to have the greatest effect. A firm that has invested heavily in AI capability but has weak adaptive leadership, for instance, is predicted by this framework to see limited resilience benefit from further AI investment until leadership capacity is addressed, a conclusion that would not be visible from a model treating each capability as an independent driver of resilience.

Policy contribution

For policymakers, the paper's treatment of AI governance as a moderating condition on the AI-resilience relationship supports the direction already visible in emerging regulation, including the Digital Operational Resilience Act and the NIST AI Risk Management Framework, and suggests that policy frameworks focused narrowly on AI safety in isolation may understate the systemic risk that arises when AI-related disruption interacts with climate or supply chain disruption within the same firm.

Methodological contribution

The paper contributes a fully specified, testable structural model, including measurement recommendations and an analytical strategy grounded in current PLS-SEM practice (Hair et al., 2022), which addresses the relative absence of quantitatively validated, integrated resilience models noted in the research gap discussed in section three.

Practical implications

In practical terms, the framework suggests that resilience-building resources should be allocated across capability, process, and governance simultaneously rather than concentrated in any single domain, and that firms should treat resilience measurement as an ongoing management discipline rather than a retrospective exercise conducted only after a disruption has already occurred.

FUTURE RESEARCH

Several research priorities follow from the framework and gaps identified in this paper. Work is needed on AI governance mechanisms specifically tailored to resilience objectives, extending beyond the compliance-oriented frameworks currently emerging in regulation toward governance models that treat AI oversight as a resilience investment in its own right. Climate resilience research would benefit from longitudinal studies tracking how firms' adaptation strategies evolve as physical exposure intensifies, building on Li's (2025) cross-sectional findings with data that can establish direction of causality over time. Digital supply chain research should examine how emerging technologies, including digital twins and blockchain-enabled traceability, affect the multi-tier visibility that this paper identifies as central to supply chain viability. Research on autonomous decision systems and human-AI collaboration should examine how much decision authority organizations can safely delegate to AI systems under conditions of genuine novelty, where historical training data may not generalize. Finally, research on sustainable organizational transformation and global business resilience should test the propositions developed in this paper across a wider range of institutional and regulatory contexts than the primarily European and North American sources reviewed here, since resilience-building conditions plausibly differ in emerging market contexts with different regulatory maturity and different baseline supply chain infrastructure.

CONCLUSION

Organizational resilience can no longer be understood as a capacity reserved for exceptional events. Artificial intelligence, climate risk, and global supply chain volatility have become standing features of the operating environment for most firms, and they interact with one another in ways that a fragmented, single-domain approach to resilience research cannot adequately explain. This paper has proposed an integrated framework linking five capability-based antecedents to four resilience outcomes through four mediating processes, conditioned by three moderating variables, and grounded in ten complementary management theories. Twelve propositions translate this framework into testable form, and a PLS-SEM methodology is proposed for empirical validation. The central argument is that resilience depends less on the presence of any single capability and more on how well an organization senses developments across domains, integrates what it learns, and acts on that learning through leadership willing to question governing assumptions rather than merely patch visible symptoms. Firms, researchers, and policymakers working on organizational resilience in the years ahead will need frameworks that treat disruption as continuous and interconnected, and this paper is offered as a step toward that kind of framework.

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