The Empowering Mechanism of Supply Chain Digital-Intelligent Collaboration on Operational Resilience: The Mediating Role of Information Sharing Quality

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Abstract. Extensive digital-intelligent collaboration often yields only modest gains in operational resilience, yet the mechanism underlying this gap remains poorly specified. This article examines the informational pathway through which digital-intelligent collaboration contributes to operational resilience and positions information sharing quality as the connecting construct. Drawing on empirical and conceptual studies published between 2021 and 2026, the article integrates organizational information processing theory with a resource orchestration reading of dynamic capabilities to build a mechanism framework. The synthesis yields four propositions: collaboration improves information sharing quality; higher-quality information strengthens resilience; collaboration has a genuine but partial direct effect on resilience; and information sharing quality partially mediates this relationship. This partial-mediation account explains why connected supply chains gain little resilience when they fail to improve the accuracy, timeliness, completeness, and relevance of shared information. It also indicates where digital-intelligent efforts should be directed.

Keywords: Digital-Intelligent Collaboration, Operational Resilience, Information Sharing Quality, Partial Mediation, Organizational Information Processing Theory

1 Introduction

Multiple shocks have changed supply chain vulnerability from an occasional threat to a persistent management problem. A pandemic may bring about a halt in production, a regional dispute may disrupt a sourcing path, and demands may diverge significantly from predictions. Digital and intelligent transformation have consequently become priorities for many organizations, who hope that connected data, interconnected systems, and synchronized decision making will enable them to withstand shocks. Real-life evidence, though, tells a different story. Significant collaboration and investments in data infrastructure and intelligent technologies do not always yield a proportional increase in the level of organization resilience. Despite having a lot of digital collaboration, organizations can still experience relatively small increases in their ability to cope with

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unexpected shocks. This indicates that the link between digital-intelligent collaboration and resilience is not straightforward and that this link needs further exploration.

Resilience is increasingly viewed as one of the most important capacities of any organization for dealing with uncertainty [1]. The role of digitalization in enabling resilience has attracted similar attention. Existing studies show that digital transformation can strengthen a supply chain's ability to withstand and recover from disruption through mechanisms such as information transparency and coordinated optimization [2]. However, even studies that identify these channels tend to verify the overall effect of digitalization without explicitly modeling the quality of shared information as a mediating construct. The enabling mechanism is pointed at, but not opened.

The critical issue may not be collaboration itself, but whether collaboration generates high-quality information sharing. When collaboration produces unreliable or untimely information, information-processing capacity may not improve, and resilience gains may not follow. Based on this logic, the present review places information sharing quality between digital-intelligent collaboration and operational resilience and treats it as the principal conduit of the enabling effect. It examines the links among the three constructs and asks how digital-intelligent collaboration supports operational resilience through an informational mechanism. The resulting integrative framework centers on information sharing quality and yields testable propositions.

2 Review Methodology

This review adopts an integrative, argument-driven approach rather than seeking exhaustive coverage. Its purpose is to assemble the evidence needed to develop and substantiate a specific mechanism, not to catalogue the field. Studies were therefore selected according to how directly they addressed digital-intelligent collaboration, information sharing quality, operational resilience, or the relationships among these constructs.

The search focused on Web of Science and Scopus. The search terms were selected based on three themes: digital-intelligent collaboration as an input, information sharing quality as a mechanism, and supply chain management (SCM) resilience as an output. This ensured that the review captured articles addressing the full mechanism rather than isolated constructs.

This review examined papers published from 2021 through 2026. Papers had to be peer-reviewed, written in English, and directly address the relevant constructs to be included. Abstracts of conference proceedings, non-empirical papers, and papers studying only one technology without any link to information exchange or resilience were not considered.

The selected papers—covering survey modeling, panel data, and conceptual reviews—serve as the foundation for the synthesis and collectively address the three focal constructs and their interrelations.

3 Conceptual Foundations

3.1 Supply Chain Digital-Intelligent Collaboration

Digital-Intelligent collaboration is the most recent phase of a longer evolutionary process. The first phase—informatization—allowed partners to exchange orders and inventory data. Then digitalization brought together these flows within a common platform. The next phase, intelligent, provided analysis and algorithms for decision-making and thus made it possible for partners to not just have common information but take actions together based on this information. Empirical studies show that this type of digitalization takes place within sourcing, production, and logistics under pressure [2].

Digital-intelligent collaboration must be clearly separated from several other terms. Broadly, digital collaboration means technology-assisted collaboration, without specifying the technology or integration level. Digital supply chain collaboration is more specific and means the connecting layer of platforms and interfaces in which partners exchange information and plan their actions. There is evidence that this layer becomes resilient and robust if it is backed by formal contracts [3]. Smart supply chain means a technological capability of the chain, which implies the sensing and automation capability, not collaborative practice. In the present article, digital-intelligent collaboration means a joint practice of integrating digital tools into the process of collaboration, integrating the collaborative process itself, and making data-based decisions. It requires technological connectivity, but it cannot be reduced to it as its main point is coordinated actions, not technologies.

3.2 Information Sharing Quality

Research on information sharing has typically emphasised quantity over quality, overlooking the possibility that information overload can impair decision-making. Recent work on resilience has accordingly shifted attention to information quality. Information sharing quality consists of four elements. Accuracy means that information is true to the current operational situation. Timeliness concerns whether information arrives within the relevant decision window. Completeness indicates whether the information covers what a decision requires, whereas relevance indicates whether it addresses the problem without introducing unnecessary noise.

3.3 Operational Resilience

Operational resilience is the ability of a supply chain to maintain functioning during disruption and return to an operational state afterwards. This ability is considered one of the key factors in handling uncertainties [1]. This term does not coincide with the concepts of robustness and agility. Robustness is the capacity to resist disruption without substantial change and therefore represents a relatively static defense. Agility concerns the speed of reconfiguration under routine volatility rather than major shocks. Resilience is broader than both because it spans the full course of a disruptive event and, unlike robustness and agility, includes recovery. This temporal scope comprises

three capabilities. Anticipation enables a chain to detect and prepare for an emerging shock. Adaptation enables it to absorb the impact and adjust while disruption persists. Recovery restores performance after the disruption. Recent research has examined how digitalization and supply chain network position contribute to operational resilience, with attention to adaptation and recovery [4].

Once the three constructs are defined, the central question becomes clearer. Each construct is well established individually, but the mechanism through which collaboration contributes to resilience remains unresolved. The following sections examine this connection and the role of information sharing quality within it. For a concise overview of the three constructs, see Table 1.

Table 1. Definitions and dimensions of the three constructs.

Construct	Definition	Dimensions
Digital-intelligent collaboration	The joint practice of embedding digital tools, integrating collaborative processes, and driving shared decisions with data across supply chain partners	Technology embedding; process integration; data-driven joint decision-making
Information sharing quality	The degree to which the information exchanged among partners can actually be used in decision-making	Accuracy; timeliness; completeness; relevance
Operational resilience	A supply chain's capacity to keep functioning through disruption and to return to a workable state once it passes	Anticipation; adaptation; recovery

4 Theoretical Lens

Organizational information processing theory provides the principal foundation for the argument. Its central premise is that organizational performance depends on the alignment between information-processing capacity and the processing demands imposed by the environment. Disruptions sharply increase these demands by exposing supply chains to novel, uncertain, and rapidly changing signals. Coping with these challenges depends not on information volume alone, but on the ability to make timely decisions—which in turn hinges on information quality.

The theory of dynamic capabilities, applied through a resource orchestration lens, offers a complementary perspective. It explains the reason behind the idea that collaboration would generate good information in the first place. Neither digital nor analytical resources can enhance the quality of information by themselves; they have to be coordinated and used together. Collaboration is responsible for accomplishing this task of orchestration. Studies considering data analytics a dynamic capability draw a connection between resource reconfiguration and better information about the state of the supply chain [5]. From this perspective, collaboration is the organizational action that converts technological resources into usable information.

Both theoretical approaches focus on the information sharing quality as the key mechanism linking collaboration and resilience. Information processing theory helps to understand how information quality enables resilience, while the dynamic capabilities approach explains how collaboration generates that quality. This allows us to define the key mechanism between collaboration and resilience.

5 The Empowering Mechanism: Synthesis and Propositions

5.1 The Constituent Links

Collaboration influences the information process before any other distal process takes place. If supply chain partners adopt digital technologies, integrate their processes, and make decisions based on collaborative data, then the direct impact will be on the information process and its quality. Process integration will help eliminate distortion in information processing caused by crossing organizational borders, while collaborative decision-making will provide partners with motivations to keep their records up-to-date and accurate.

P1. Digital-intelligent collaboration improves information sharing quality.

The next connection links the quality of information sharing to resilience. High-quality, timely, comprehensive, and relevant information allows the supply chain to foresee a potential disruption, react during the time of the disruption, and recover from the effects of the disruption. Research on visibility provides closely related evidence, since a clear and usable view of the supply chain reflects several dimensions of information quality. Grounded in information processing theory, this work shows that improved visibility strengthens a firm's capacity to withstand disruption [6]. Poor information quality makes it likely that the same collaboration system would add very little to the firm’s resilience.

P2. Information sharing quality improves operational resilience.

5.2 The Direct Path and Its Limits

Collaboration could also enhance resilience via processes that are not affected by information quality at all. Planning in concert can create relational links, diversify risks, and generate redundancy, enabling a supply chain to endure external shock. Thus, it seems reasonable to say that a direct effect cannot be ruled out. This route diverges from the mediated one in that it relies on relational and buffering processes and not on information management. However, its extent and boundary conditions still need to be determined. A direct effect that is real yet partial is thus a more appropriate assumption and opens up the possibility of an extra mechanism.

P3. Digital-intelligent collaboration has a direct effect on operational resilience, but the effect is partial rather than sufficient.

5.3 Information Sharing Quality as Mediator

Where collaboration fails to enhance information quality, resilience gains are limited—suggesting mediation. Some of the effects of collaboration take place indirectly through the quality of information exchange, but there is still some direct effect left. Thus, mediation takes place partially and not fully; this is in accordance with the direct effect in the path P3. Research investigating the connection between digitalization and resilience via the mediator of coordination supports such a mediation [7].

This helps to provide an answer to the conundrum mentioned in the beginning. Corporations can make large investments in collaboration through digital tools but not gain much in terms of resilience when such collaborations do not lead to effective information flow. In such situations, collaboration exists but the information channel does not. It is at this point that the supply chain either becomes informed, turning digital assets into resilience assets, or remains uninformed.

P4. Information sharing quality partially mediates the relationship between digital-intelligent collaboration and operational resilience, as summarized in Figure 1.

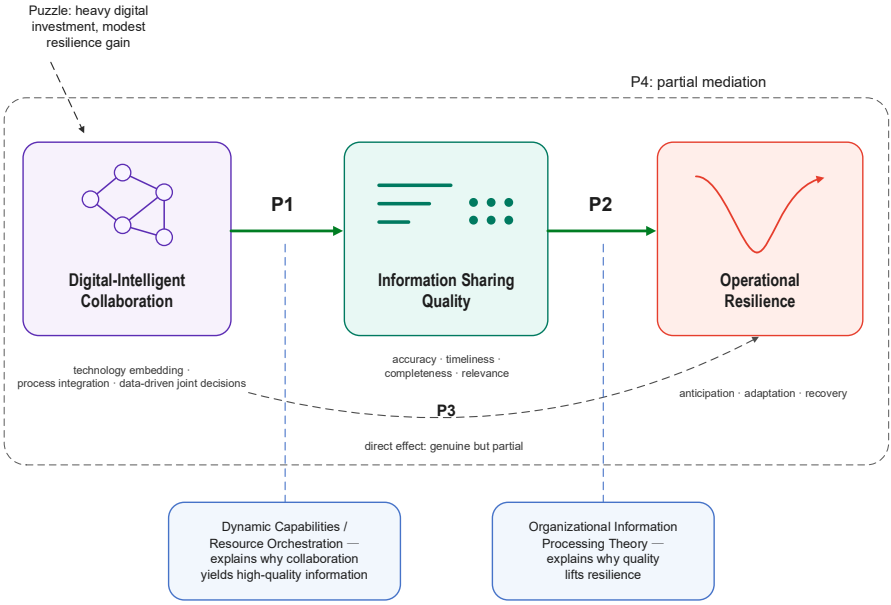


Fig. 1. The integrative framework: information sharing quality partially mediates the relationship between digital-intelligent collaboration and operational resilience.

6 Discussion and Research Agenda

This approach makes three contributions to our understanding of how digital-intelligent collaboration leads to organizational resilience. First, it presents a mechanism for explaining this relationship by using information exchange quality as the basis rather than assuming a linear effect of digital-intelligent collaboration. Second, it moves away from

measuring the extent of information exchange to information exchange quality, and suggests that connectivity means very little if the information being exchanged is not accurate, current, and relevant. Third, it extends information processing theory to the context of digital-intelligent collaboration.

Two questions remain open. P3 proposes that the direct path is genuine but partial, but its boundary conditions have not been specified, and the source of the residual direct effect in P4 remains unclear. Relational trust, redundancy, and risk sharing are plausible mechanisms, although the present framework does not distinguish among them. Addressing these issues requires empirical tests of the four propositions, particularly P4, with mediation estimated rather than inferred conceptually. The framework also suggests potential moderators. Environmental turbulence may condition the extent to which information quality contributes to resilience. Supply chain complexity may similarly determine how much collaboration is required before information quality improves. Future research should therefore extend survey-based structural models with longitudinal and case-based designs capable of tracing the mechanism across the course of an actual disruption. Table 2 summarizes this agenda in relation to the gaps and questions.

Table 2. Research agenda.

Gap	Open question	Suggested approach
Direct path underspecified (P3)	Under what conditions, and how strongly, does collaboration lift resilience directly?	Survey-based SEM with boundary-condition tests
Source of residual direct effect (P4)	What carries the direct effect that survives partial mediation?	Multi-mediator models isolating trust, redundancy, risk-sharing
Mechanism untested over time	Does the indirect path hold across the phases of a real disruption?	Longitudinal and case-based designs
Moderators unexamined	How do environmental turbulence and supply chain complexity condition the mechanism?	Moderated-mediation models

7 Conclusion

This article examines how digital-intelligent collaboration contributes to operational resilience and locates the mechanism in the quality of information produced through collaboration. The proposed framework treats information sharing quality as the conduit through which a connected supply chain converts coordination into the capacity to anticipate, adapt, and recover. A direct effect of collaboration remains alongside this indirect path. Partial mediation therefore provides an explanation for the gap between digital investment and realized resilience: collaboration strengthens resilience primarily

to the extent that it improves the information available to supply chain partners. As a conceptual synthesis, this article offers testable propositions rather than empirical estimates, thus providing a structured basis for future empirical work.

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