



**Blockchain-driven Supply Chain Resilience and Performance
from a Relational Perspective: The Role of Inter-
organizational Relationship and Systems Adaptability**

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Adaptability**

Abstract

Purpose: This study investigates how blockchain technology enhances supply chain resilience and relationship performance by reinforcing inter-organizational relationships. Drawing on the relational view and boundary object perspective, we examine how blockchain influences relational trust and network capability, strengthening supply chain resilience and ultimately improving relationship performance.

Design/methodology/approach: We proposed a conceptual framework and tested it using structural equation modeling (SEM) based on survey data collected from 251 manufacturing firms in China.

Findings: The results indicate that blockchain technology significantly enhances supply chain resilience and improves relationship performance by fostering relational trust and network capability among supply chain partners. However, inter-organizational systems adaptability was found to negatively moderate the relationship between supply chain resilience and relationship performance, suggesting that system complexity may reduce the relational benefits of resilience.

Originality: This study shifts the theoretical focus from the resource-based view to a relational perspective, providing new insights into how blockchain technology strengthens supply chain relationships to improve resilience and performance. It also challenges assumptions about technological adaptability by revealing that greater flexibility in inter-organizational systems may introduce coordination burdens that diminish relationship outcomes.

Keywords: Blockchain technology, Supply chain relationships, Supply chain resilience, Relationship performance, Interorganizational systems adaptability.

1. Introduction

As the global economy gradually recovers, supply chain vulnerabilities across industries have become increasingly exposed, particularly under the forces of globalization and digitalization (Ivanov, 2024). For instance, manufacturing disruptions caused by the COVID-19 pandemic revealed the fragility of global supply networks. These events highlight the urgent need for firms to build greater resilience to cope with shocks (Baghersad & Zobel, 2021; Fan et al., 2023). Supply chain resilience, defined as a firm's ability to maintain continuity and rapidly adapt supply chain structures during unforeseen disruptions, has become a critical capability for navigating today's dynamic, uncertain markets (Singh, 2024; Wulandhari et al., 2023). As environmental uncertainty and complexity intensify, supply chain resilience has become critical for maintaining competitiveness in dynamic markets (Nayal et al., 2023).

Blockchain technology has emerged as a promising digital enabler due to its decentralized structure, data transparency, and immutability (Cong & He, 2019; Kshetri, 2018). These features improve the efficiency and visibility of information flows, allowing supply chain partners to access and verify real-time data, reduce information asymmetry, and lower compliance risks (Latan et al., 2024). Blockchain enhances trust by ensuring data authenticity and reliability, fostering deeper collaboration (Chen et al., 2023).

However, achieving resilience relies on a firm's internal capabilities and heavily depends on the quality of relationships with supply chain partners (Faruquee et al., 2021; Tarigan et al., 2021). Effective supply chain management requires connectivity and coordination that transcend organizational boundaries. High-quality relationships among supply chain partners can reduce information asymmetry, lower transaction costs, and enhance the overall synergies within the supply chain, thereby strengthening its resilience and recovery capacity (Wei et al., 2024; Yang et al., 2022). These observations highlight the crucial role of relational mechanisms in shaping how firms respond to and recover from disruptions. However, most existing studies emphasize technical benefits such as transparency and efficiency (Tian et al., 2024; Uvet et al., 2025) and rarely investigate how blockchain enhances relational mechanisms to strengthen supply chain resilience. Accordingly, we pose our first research question: *How does blockchain technology promote supply chain resilience by enhancing relational mechanisms?*

Although supply chain resilience is typically associated with operational continuity and risk mitigation, it may also generate relational value by enabling firms to maintain reliability, responsiveness, and coordination under dynamic and uncertain environments. Relationship performance refers to the mutual benefits and collaborative outcomes that emerge from sustained inter-organizational interactions (Rai et al., 2012). It reflects how firms and their

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partners achieve shared value through efficient coordination, aligned objectives, and practical cooperation. This performance outcome of resilience has received limited empirical attention.

Furthermore, the technological infrastructure supporting these mechanisms can significantly affect how resilience translates into performance outcomes. One such infrastructure is inter-organizational systems adaptability (IOS), which refers to the ability of interconnected information systems between supply chain partners to flexibly adjust to changing external environments (Dong et al., 2017). From a boundary object perspective (Zhou et al., 2024), IOS serve as shared artifacts that help partners coordinate and align knowledge across organizational boundaries. Adaptive IOS facilitates communication, reduces interpretive ambiguity, and promotes collaborative action in uncertain situations. To explore this effect, we pose the second research question: *How does supply chain resilience influence relationship performance, and how is this relationship shaped by interorganizational systems adaptability?*

Prior research on supply chain resilience has adopted the resource-based or dynamic capabilities perspective, emphasizing internal resources and capabilities as key drivers (Dubey et al., 2023). While these perspectives provide valuable insights into firm-centric capabilities, they fail to capture how blockchain transforms inter-organizational relationships, equally vital for resilience. The resource-based view focuses on proprietary assets within firms, while dynamic capabilities emphasise the reconfiguration of internal processes; neither fully explains how distributed digital technologies, such as blockchain, reinforce trust and network coordination across firm boundaries. These theories lack the explanatory power to account for blockchain’s relational impact. In contrast, the relational view emphasizes the strategic value of inter-firm trust, commitment, and resource integration (Dyer & Singh, 1998). Through this perspective, blockchain is not merely a technical tool but a relational enabler that strengthens inter-organizational ties and supports collective responsiveness during disruption. This shift in theoretical focus enables us to better understand how blockchain facilitates resilience through relational mechanisms, moving the conversation beyond efficiency-based explanations.

This study offers several contributions to supply chain management. It advances theory by shifting the analytical lens from the resource-based and dynamic capabilities perspectives to the relational view. It also integrates the boundary object perspective to conceptualize inter-organizational systems adaptability as a moderating factor, offering insight into when resilience translates into relationship performance. It also informs practice by guiding the leveraging of blockchain to enhance trust and network capabilities, and balance technological adaptability with relational stability to improve supply chain resilience and performance. These

contributions are supported by empirical evidence from a survey of 251 manufacturing firms in China.

The following parts of the paper are divided into several sections. The theoretical background is thoroughly examined in the following sections, which also develop hypotheses and empirically evaluate the suggested model. After discussing the theoretical and practical consequences of the results, suggestions for further research are made.

2. Theoretical underpinnings

2.1 *The relational view*

The relational view, proposed by Dyer and Singh (1998), emphasizes that cooperative relationships between firms can be a source of competitive advantage. According to this theory, firms can achieve above-average returns, referred to as relational rents, by establishing and maintaining specific cooperative relationships (Dyer & Singh, 1998; Zhang et al., 2017). Unlike the resource-based view, which centers on internal resources (Hitt et al., 2016; Wernerfelt, 1984), the relational view emphasizes inter-firm collaboration through relationship-specific assets, knowledge sharing, complementary resources, and governance mechanisms (Cislighi et al., 2022; Lavie, 2006). For instance, joint research and development efforts or investments in specialized equipment can enhance inter-firm dependencies and deepen cooperative relationships. Additionally, regular information sharing and knowledge exchange help accelerate the flow of information, thereby improving a firm's responsiveness in dynamic environments (Kim & Chai, 2017). Complementary resources and capabilities, when combined through collaboration, enable firms to gain a competitive advantage in dynamic markets. At the same time, effective governance mechanisms establish clear cooperation rules, reduce conflicts and uncertainties, and ensure the stability of the partnership (Krishnan et al., 2016).

The relational view provides a theoretical foundation for understanding how blockchain technology can foster supply chain resilience through relational mechanisms. Inter-firm cooperation depends on trust, resource complementarity, and shared governance mechanisms (Dyer & Singh, 1998). Blockchain's features enhance trust by ensuring information integrity and reducing opportunism. These characteristics promote knowledge sharing and joint coordination among supply chain partners, which are critical relational mechanisms for collective responsiveness during disruptions. Blockchain supports the development of relationship-specific assets and collaborative routines that strengthen a supply chain's ability

to absorb and recover from shocks.

In turbulent environments, resilience enables firms to maintain stable interactions and quickly restore collaborative mechanisms, thus preserving the mutual value generated through inter-organizational ties. Relational rents arise from efficiency gains and the continuity of joint value creation in the face of external shocks. Resilient supply chains are more likely to sustain relationships, minimize disruption-induced conflicts, and align objectives across partners, which enhances relationship performance. Resilience can be conceptualized as a dynamic capability and a relational asset facilitating long-term relationships.

2.2 Boundary object perspective

Star and Griesemer (1989) initially proposed the boundary object perspective to describe shared artifacts that bridge knowledge gaps across different social communities, such as organizations or disciplines. These boundary objects maintain a standard structure while being sufficiently flexible to accommodate local needs, enabling collaboration in contexts marked by cognitive or structural differences. Carlile (2004) further conceptualized three levels of knowledge boundaries: syntactic boundaries, semantic boundaries, and pragmatic boundaries. In the supply chain context, inter-organizational systems can be seen as boundary objects facilitating shared decision-making and information exchange through standardized interfaces and flexible architectures (Dong et al., 2017).

IOS adaptability refers to the ability of these systems to rapidly reconfigure processes, data structures, and collaboration mechanisms in response to environmental changes. This adaptability enhances real-time responsiveness and helps firms build shared understanding, coordinate reactions, and reestablish collaboration when facing disruptions (Zhou et al., 2024). The more adaptable the IOS, the more effectively they function as dynamic boundary objects that allow supply chain partners to bridge semantic and pragmatic boundaries, thus achieving collective goals under volatile conditions.

This study integrates the relational view and the boundary object perspective as complementary lenses for understanding the relational mechanisms and the technological enablers of supply chain resilience. The relational view explains how trust-based collaboration, resource complementarity, and governance mechanisms enable inter-organizational relationships to generate sustained competitive advantage, providing the foundation for understanding how blockchain fosters resilience and relationship performance. However, it does not fully account for how digital infrastructures support or hinder these mechanisms under

dynamic conditions. The boundary object perspective addresses this gap by explaining how inter-organizational systems act as shared artifacts that bridge knowledge and coordination gaps across organizational boundaries. When highly adaptable, IOS can function as dynamic boundary objects that promote shared understanding and synchronized responses.

3. Hypotheses development

3.1 *The driving of blockchain in supply chain resilience*

Events such as natural disasters, geopolitical conflicts, and global pandemics frequently threaten the continuity and stability of supply chains (Sodhi & Tang, 2021). Consistent with previous research, we understand supply chain resilience as the capability of the supply chain to withstand shocks, minimize performance loss during disruptions, and rapidly recover to a stable and functional state (Johnson et al., 2013). This capability reflects a supply chain's ability to maintain operational continuity in the face of adversity, absorb and buffer against disruptions as they occur (Brusset & Teller, 2017), and subsequently return to its original or improved state through effective recovery and adaptation (Ali et al., 2017). In complex supply networks, close coordination and effective communication between partners are essential to managing risks across all supply chain segments, including upstream suppliers, internal operations, and downstream customers (Zhang et al., 2025).

Blockchain technology has emerged as a key digital enabler to strengthen supply chain resilience. With its core features of decentralization, immutability, and smart contracts, blockchain provides a secure and trustworthy platform for data sharing across organizational boundaries (Aoun et al., 2021; Upadhyay, 2020). These characteristics reduce information asymmetry, enhance supply chain visibility, and lower compliance risks (Latan et al., 2024).

The transparency enabled by blockchain ensures that all stakeholders have access to accurate and timely data, facilitating proactive decision-making and synchronized responses under disruption (Akindotei et al., 2024). The immutability of blockchain data builds inter-organizational trust, reinforcing stable and collaborative relationships (Brookbanks & Parry, 2022). Furthermore, smart contracts automate transactions and enable real-time coordination, improving operational responsiveness and agility (De Giovanni, 2020; Kimani et al., 2020). By reducing uncertainty, enabling real-time responses, and fostering collaborative behavior, blockchain helps firms strengthen resistance to disruptions and recovery capabilities after shocks (Brandín & Abrishami, 2024). Therefore, we propose the following hypothesis:

H1: Blockchain adoption is positively related to supply chain resilience.

3.2 Relational mechanisms: The role of relational trust and network capability

Relational mechanisms are the structural and behavioral attributes that facilitate collaboration among supply chain partners (Cao & Zhang, 2011; Liu et al., 2009). Drawing on the relational view, we conceptualize relational trust and network capability as different yet complementary mechanisms through which blockchain enhances supply chain resilience via improved interfirm collaboration. Relational trust is a cognitive and affective belief in a partner's reliability and goodwill, fostering openness, reducing fears of opportunism, and encouraging voluntary information sharing (Wang et al., 2014). In contrast, network capability is an organizational-level competence that reflects a firm's ability to identify, integrate, and coordinate resources across its partner network through structured routines and interaction skills (Arasti et al., 2022; Vesalainen & Hakala, 2014). While related, trust emphasizes relational expectations, whereas network capability accentuates relational execution and resource orchestration. Both constructs serve as complementary enablers of collaborative resilience, allowing the capture of the behavioral and structural aspects of how blockchain supports relational resilience.

Relational trust is the confidence that partners will act in each other's interest, developed over repeated interactions and shared experiences. Built through long-term collaboration, relational trust reduces uncertainty, promotes information sharing, and enables quicker joint responses in dynamic environments (Bai et al., 2024; Luo, 2002; Wei et al., 2012). According to the relational view, relational trust is considered a valuable, rare, and inimitable resource that helps firms engaged in long-term partnerships gain a sustained competitive advantage (Dyer et al., 2018). Relational trust fosters openness and reduces opportunistic concerns, allowing partners to share information and resources without fear of exploitation (Li et al., 2024). Furthermore, relational trust encourages supply chain partners to align their objectives better, collectively working towards common goals (Delbufalo, 2012; Poppo et al., 2016). In a highly complex and dynamic supply chain environment, trust ensures that partners can rely on each other during times of crisis, allowing for a quicker response to uncertainties (Zafari et al., 2020).

Blockchain strengthens relational trust by offering shared, immutable data that reduces asymmetry and eliminates the need for intermediaries (Centobelli et al., 2022; Li et al., 2023). For example, the transparent platform provided by blockchain allows all participants to view

the complete transaction history in real time, and this openness dramatically enhances the sense of trust between partners (Huzaiifa, 2024). This characteristic ensures the accuracy and authenticity of information, giving supply chain members confidence in the data they share. Based on this, we hypothesize:

H2: Blockchain adoption is positively related to the level of relational trust.

Network capability is defined as the ability of a firm to obtain, integrate and utilize external resources to enhance its competitiveness through establishing and managing external relationships (Ritter & Gemünden, 2003; Walter et al., 2006). Network capability helps firms better identify opportunities in complex supply chain networks, optimize resource allocation, and respond to uncertainties in operations (Arasti et al., 2022). Network capability is often measured through multiple dimensions, which cover the different skills and abilities that firms need to manage external partnerships, including coordination capabilities, relationship management skills, partner knowledge and internal communication (Ritter & Gemünden, 2003; Walter et al., 2006).

The decentralized information-sharing mechanism of blockchain enables all parties in the supply chain to share transparent and tamper-proof information in real-time (Xue et al., 2021). This reduces information asymmetry and enhances everyone's understanding of supply chain dynamics. With this level of transparency, firms can better coordinate and integrate resources within the supply chain. It allows nodes within the supply chain to share information more effectively, collaborate on decisions, and optimize resource allocation. By eliminating the need for intermediaries, blockchain lowers business collaboration costs, making resource allocation and process integration smoother (Rejeb et al., 2021). Therefore, we propose:

H3: Blockchain adoption is positively related to the level of network capability.

Literature suggests that strong relational trust fosters partners' willingness to collaborate (Poppo et al., 2016). When partners trust each other, they are more inclined to adopt collaborative strategies to address external shocks collectively. This cooperation improves the flow of information and enhances the ability to integrate resources, allowing the supply chain to adjust resource allocation more flexibly in times of crisis (Changjoon & Soohyo, 2024). Over the long term, firms are more likely to establish norms and processes to address unforeseen events, thereby reducing their dependence on external factors and improving their

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adaptability. Trusting relationships between firms can mitigate information asymmetries, allowing firms to quickly identify and respond to potential risks and challenges, thereby strengthening supply chain adaptability (Bai et al., 2024). Thus, we propose the following hypothesis:

H4: Relational trust is positively related to supply chain resilience.

Firms with strong network capabilities can efficiently integrate and coordinate resources within the supply chain network (Partanen et al., 2020). By maintaining close ties with supply chain partners, these firms can swiftly share critical resources (such as raw materials and logistics capacity) and make timely adjustments during unforeseen events, mitigating the impact of supply chain disruptions (Song et al., 2020). Improved resource integration reduces coordination costs and operational barriers, making the supply chain more agile and efficient in the face of external changes (Iyer et al., 2023). Another aspect of network capability is the effective interaction and information-sharing mechanisms established between firms and their partners within the supply chain (Partanen et al., 2020). This capability fosters innovation, allows firms to rapidly develop new products and services, and strengthens risk management by helping them identify and address potential threats. Thus, we propose the following hypothesis:

H5: Network capability is positively related to supply chain resilience.

Based on the above reasoning, blockchain directly influences supply chain resilience and works indirectly by transforming the relational structures within the supply network. Relational trust and network capability serve as key relational enablers that mediate the impact of technological adoption on resilience. Blockchain enhances the quality of inter-organizational relationships by strengthening trust and enabling firms to access and mobilize network-based resources. These relational improvements support more effective disruption response and system recovery. From the relational view perspective, both relational trust and network capability are considered strategic relational resources that facilitate joint coordination, reduce information asymmetry, and enable firms to respond to external shocks collectively (Dyer & Singh, 1998). Accordingly, we hypothesize:

H6a. Relational trust mediates the relationship between blockchain adoption and supply

chain resilience.

H6b. Network capability mediates the relationship between blockchain adoption and supply chain resilience.

3.3 Supply chain resilience and relationship performance

In the context of supply chain management, relationship performance refers to the mutual value creation and collaborative outcomes that emerge from sustained inter-organizational interactions (Rai et al., 2012). It reflects how partners effectively coordinate and align their strategic goals and jointly respond to environmental challenges. Relationship performance emphasizes not only transactional efficiency but also the long-term benefits derived from stable and adaptive relationships, such as improved decision-making, reduced conflict, and enhanced innovation (Ryu et al., 2009; Wang & Hu, 2020). Unlike operational or financial performance, which focuses on firm-centric outcomes, relationship performance captures the quality and continuity of inter-firm collaboration. It includes tangible outcomes, such as improved service levels, process integration, and delivery reliability, and intangible outcomes like partnership continuity, mutual satisfaction, and shared strategic gains (Fink & Kessler, 2010; Selnes & Sallis, 2003).

Prior studies have recognized relationship performance as a critical outcome of well-functioning supply chain relationships, especially in volatile environments where coordinated adaptation is vital (Awan et al., 2018; Paul & McDaniel Jr, 2004). Supply chain resilience enables a firm to maintain stable relationships during disruptions by providing timely responsiveness, operational flexibility, and recovery capabilities (Ge et al., 2023). Resilient supply chains are better equipped to maintain coordination and responsiveness during disruptions, contributing to stronger relational outcomes (Cui et al., 2022). When firms can resist performance deterioration and recover effectively from shocks, they safeguard their operations and reinforce their partners' confidence in the relationship. This fosters deeper collaboration, promotes sustained communication, and enhances the perceived value of the partnership.

From the relational view, collaborative relationships can be a source of sustained competitive advantage derived from partnership networks, especially when the resources, processes, knowledge, and capabilities shared among partners are complementary and difficult to imitate (Dyer & Singh, 1998). Supply chain resilience helps preserve and regenerate mutual value and collaborative outcomes by maintaining stable interactions and swiftly restoring

cooperative mechanisms in the event of disruptions. Thus, resilience is an operational capability for coping with crises and a strategic relational asset enabling ongoing value creation within inter-organizational partnerships. Based on this argument, the following hypothesis is proposed:

H7: Supply chain resilience is positively related to relationship performance.

3.4 The moderating role of inter-organizational systems adaptability

Inter-organizational systems adaptability is the ability to readily adapt or reconfigure to meet constantly changing requirements (Dong et al., 2017). IOS adaptability can be achieved by utilizing open standard technological architectures (such as Extensible Markup Language) or by applying modular architectures and structured data formats in the design process. IOS adaptability differs from IT flexibility, which concerns adjustments within a single firm’s technological infrastructure (Jorfi et al., 2017), and supply chain flexibility, which emphasizes operational responses in procurement, production, or logistics (Jafari et al., 2023). IOS adaptability resides at the inter-organizational systems layer, and it captures the joint, cooperative capacity of partner firms to adjust shared data structures, interfaces, and coordination routines embedded in their boundary-spanning information systems (Mandal & Dubey, 2021). It reflects a relational capability that depends on mutual governance, compatibility, and co-evolution across firms, rather than intra-firm technological adjustments or operational flexibility. Adaptable inter-organizational systems help firms adjust their operational processes on time and ensure an adequate flow of information and resources between partners (Liu et al., 2019).

Supply chain resilience helps firms cope with changes under external shocks, but its effectiveness depends on efficient coordination and information flow to be translated into improved relationship performance. When unexpected events occur in the supply chain or the external environment changes, highly adaptive inter-organizational systems can respond to these changes on time, support the efficient operation of supply chain resilience, and ultimately improve the relationship performance between partners. In addition, with highly adaptive inter-organizational systems, information can be shared more smoothly among supply chain partners, reducing misunderstandings and mistrust caused by information asymmetry (Inderfurth et al., 2013). This means that although supply chain resilience can promote the maintenance of cooperative relationships in the face of external shocks, such cooperative relationships will be

even more stable with the support of highly adaptive inter-organizational systems, further improving relationship performance.

From the boundary object perspective, inter-organizational systems serve as shared artifacts that bridge organizational boundaries by facilitating mutual understanding and joint coordination. High adaptability allows these systems to dynamically adjust in response to external disruptions, enabling supply chain partners to overcome interpretive and operational misalignments. As a result, adaptive inter-organizational systems amplify the relational benefits of resilience by promoting effective communication and synchronized actions. Therefore, we propose the following hypothesis:

H8: Inter-organizational systems adaptability positively moderates the relationship between supply chain resilience and relationship performance.

The framework (Figure 1) illustrates how blockchain can be applied to enhance supply chain resilience and relationship performance.

Insert Figure 1 here.

Figure 1. Conceptual model

4. Research methodology

4.1 Study context

As one of the world's largest manufacturing bases, China presents a significant backdrop for studying supply chain management due to its unique economic, political, and social conditions. China's manufacturing sector is a critical component of the global supply chain. As a major global producer and exporter, Chinese manufacturing plays a vital role in the stability and resilience of the global supply chain. In recent years, the Chinese government has placed a high importance on the digital transformation of supply chains, encouraging firms to adopt advanced technologies, such as blockchain, to enhance supply chain transparency and efficiency. This policy environment provides a practical basis for studying the application of blockchain technology in supply chain management.

Chinese manufacturing firms have demonstrated strong adaptability in responding to complex and changing market conditions. For instance, external shocks such as US-China trade tensions and COVID-19 have prompted Chinese firms to accelerate the development of supply

1 chain resilience to address international market uncertainties. The practices of these firms in
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3 enhancing supply chain resilience offer valuable empirical material for exploring how
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5 blockchain technology can improve supply chain relationships and thereby strengthen
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7 resilience and performance. While existing literature often focuses on supply chain
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9 management practices in developed countries, emerging markets, and vast and strategically
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11 essential economies like China require more academic attention. By studying Chinese
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13 manufacturing, we can expand the applicability of supply chain management theories across
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15 different economic contexts and provide more universally relevant insights for building global
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17 supply chain resilience.
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20 **4.2 Data collection procedures**

21 **4.2.1 Sampling**

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23 We conducted an online survey in China via a professional market research platform widely
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25 used in management studies. To ensure response quality, the platform applies strict multi-layer
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27 screening and verification to remove low-quality samples, ensuring representativeness,
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29 accuracy and credibility. The survey was administered online, offering financial incentives to
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31 senior or middle managers responsible for supply chain strategy and decisions, as they possess
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33 deep insights into firm dynamics. All surveyed firms served as focal firms in their respective
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35 supply chains, meaning they were the primary coordinators responsible for managing
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37 relationships with upstream suppliers and downstream distributors. Four university researchers
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39 and three industry managers pre-tested the questionnaire, with researchers assessing its
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41 scientific rigor and validity, and managers providing practical feedback to ensure it reflected
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43 real-world inter-firm supply chain relationships.

44 We distributed a total of 433 questionnaires and received 266 responses. After initial
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46 screening by the platform, additional attention checks and manual reviews, 15 invalid
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48 responses were removed, resulting in 251 valid questionnaires and a response rate of 58.19%.
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50 The firm and respondent characteristics in Table 1 are detailed. The final sample encompasses
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52 a diverse range of manufacturing sectors, firm size, and managerial positions, reflecting the
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54 structural complexity of Chinese manufacturing. This diversity enhances the representativeness
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56 of the dataset, ensuring that the findings capture multiple perspectives within China's
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58 manufacturing landscape. Given China's central position in global supply chains and its
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60 advanced policy-driven digital transformation, the data offer robust empirical insights that can
be meaningfully generalized to other emerging economies sharing similar institutional

conditions, such as government-led innovation, rapid industrial upgrading, and exposure to external shocks. Accordingly, the sample provides a reliable empirical basis for examining supply chain phenomena in emerging-market contexts and offers valuable insights that can inform broader discussions of global supply chain resilience and digital collaboration.

Insert Table 1 here.

Table 1. Sample characteristics.

4.2.2 Measures

Based on our experience with previous research, we adopted and adjusted the measurement items. Respondents rated the items on a seven-point Likert scale to indicate their level of agreement, ranging from ‘1’ = ‘strongly disagree’ to ‘7’ = ‘strongly agree’. Table 2 lists the measurement items.

Insert Table 2 here.

Table 2. Confirmatory factor analysis on measures.

To measure the extent of blockchain adoption and implementation in supply chain management, we used a scale developed by Dubey et al. (2020), which includes five items. Supply chain resilience was measured using the approaches combined from Golgeci and Kuivalainen (2020) and Lin et al. (2023), with five items. We followed Rahman et al. (2023) and modified items to assess the relationship performance. Relational trust was measured using four items from Casidy and Yan (2022). Measurement items to gauge the network capability were adapted from Martín et al. (2022), which consisted of four items. Similarly, inter-organizational system adaptability is measured through three questions that refer to the research of Dong et al. (2017).

To ensure the robustness and generalizability of our results, several organizational-level control variables are included: Firm size, measured by employee count, indicates resource capacity and market influence, with notable differences in resource allocation, technology adoption, and supply chain practices across sizes. Firm age reflects maturity and market experience; younger firms tend to be more agile and open to innovation, whereas older firms often benefit from established networks and stability (Wang et al., 2022). Ownership type, categorized as state-owned, private, joint ventures, or wholly foreign-owned, captures governance differences that may affect decision-making autonomy and strategic orientation (Wang et al., 2022). The degree of internationalization, measured by the proportion of foreign

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3 sales, indicates global engagement, with highly internationalized firms more attuned to global
4 risks and prioritizing cross-border resilience and coordination (Pindado et al., 2023). These
5 controls help account for firm-level heterogeneity that could otherwise bias the estimation of
6 the hypothesized effects.
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12 **5. Data analysis and results**
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14 To examine the proposed hypotheses, this study uses the robust analytical capabilities of partial
15 least squares structural equation modelling (PLS-SEM), specifically the SmartPLS version
16 4.1.1.2 software. Unlike CB-SEM, which is primarily suitable for confirmatory testing and
17 overall model fit assessment, PLS-SEM is well aligned with exploratory, prediction-oriented,
18 and theory-building objectives (Chien et al., 2020). The study can explore the complex
19 relationships that build the existing model in greater detail because the exploratory character
20 of the research aims creates an atmosphere that is more conducive to discovery than validation.
21 PLS-SEM is more suitable than CB-SEM, which emphasizes model fit rather than variance
22 explanation (Hair et al., 2024). Second, the existing framework’s intricacy, which connects
23 different interaction effects, creates difficulties that PLS-SEM is remarkably well-suited to
24 handle deftly. Finally, the model’s prediction power may be thoroughly assessed using the
25 cutting-edge *PLSpredict* technique, yielding deep insights beyond the research’s initial
26 conclusions and opening new lines of inquiry.
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37 **5.1 Common method variance (CMV)**
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39 To ensure the validity, we took several steps to address CMV. First, we implemented
40 procedural remedies by pre-testing the questionnaire with six academic experts for clarity,
41 grouping items logically to reduce ambiguity and priming, assuring anonymity, and using
42 varied response scales to limit similarity bias. Second, we applied the measured latent marker
43 variable (MLMV) as a statistical remedy (Lindell & Whitney, 2001). Drawing from prior
44 studies (Gupta et al., 2007; Liu et al., 2023), we used respondents’ dining preferences as a
45 theoretically unrelated marker variable. Participants rated aspects such as restaurant cleanliness,
46 food presentation, and service quality on a 7-point scale. Following the approach of Chin et al.
47 (2013) and Koay et al. (2021), we estimated the structural model by including the marker
48 variable as a control. As shown in Table 3, the marker variable exhibited only trivial and
49 statistically non-significant correlations with all core constructs, supporting its validity as an
50 unrelated variable. The inclusion did not significantly alter the path coefficients, indicating that
51 CMV did not materially affect our results. These findings collectively suggest that CMV is
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unlikely to pose a significant threat to the validity of our conclusions.

Insert Table 3 here.

Table 3. Measured latent marker variable (MLMV).

5.2 Measurement model analysis

The full measurement model results are presented in Table 2, which includes the standard loadings, Cronbach's alpha, average variance extracted (AVE), and composite reliability (CR) values for the items used in our preliminary analysis. All values meet or exceed the recommended thresholds for AVE (0.5) and CR (0.6), as suggested by Fornell and Larcker (1981). Additionally, the external loadings of the indicators, all above 0.70, confirm the reliability of individual measures. The Cronbach's alpha values, all exceeding 0.7, further demonstrate the high reliability of the constructs (Hair et al., 2022). This study demonstrates discriminant validity.

Table 4 presents the correlation coefficients among all independent variables, which are relatively low. Following the guidelines of PLS analysis methods (Chin, 2009), we first employed two approaches to assess discriminant validity. The results of the paired chi-square difference tests for all latent constructs were significant ($p < 0.01$). Moreover, as the square roots of the AVE for each construct exceeded the inter-construct correlations (Fornell & Larcker, 1981), discriminant validity was established (see Table 5). These findings indicate that the measurement model employed in this study is both valid and internally consistent (MacKenzie & Podsakoff, 2012).

Insert Table 4 here.

Table 4. Correlations between the variables.

We further assessed discriminant validity using the heterotrait-monotrait ratio (HTMT) criterion (Henseler et al., 2015). In this study, all HTMT values were below the threshold of 0.850 (Hair et al., 2019), providing additional evidence for establishing discriminant validity (see Table 5).

Insert Table 5 here.

Table 5. Discriminant validity - HTMT criterion and Fornell-Larcker criterion.

5.3 Assessment of structural model

Before estimating the path coefficients, collinearity among the predictor constructs of each endogenous variable was assessed using the variance inflation factor (VIF). As shown in Table 6, all the VIFs (1.000-2.068) were below the conservative threshold of 3.3 (Becker et al., 2023), suggesting that multicollinearity does not bias the structural model estimates.

Table 6 displays the results, indicating support for the proposed hypotheses. The results suggest that blockchain adoption significantly enhances supply chain resilience ($\beta = 0.209$, t -value = 2.904, $p < 0.02$), supporting *H1*. This finding shows that blockchain enhances supply chain resilience by increasing transparency, traceability, and coordination, supporting *H1*. Consistent with prior research, blockchain enables firms to respond more effectively to uncertainties and external shocks through improved information sharing and optimized supply chain processes (Petratos & Faccia, 2023). Similarly, blockchain adoption was found to significantly promote relational trust ($\beta = 0.630$, t -value = 13.503, $p < 0.01$) and network capability ($\beta = 0.647$, t -value = 14.154, $p < 0.01$). This finding suggests that blockchain enhances relational trust through greater transparency and traceability, improving network capabilities through improved data sharing and coordination. These benefits underscore its broad potential in supply chain relationships.

The study found that relational trust ($\beta = 0.354$, t -value = 6.076, $p < 0.01$) and network capability ($\beta = 0.233$, t -value = 3.469, $p < 0.01$) significantly enhance supply chain resilience, supporting *H4* and *H5*, respectively. These findings underscore the pivotal role of relational trust in promoting collaboration, facilitating information sharing, and mitigating uncertainty to enhance supply chain responsiveness. Strengthening network capability further enables firms to integrate resources better and coordinate across multiple supply chain nodes. Furthermore, the study found that supply chain resilience has a positive impact on relationship performance ($\beta = 0.416$, t -value = 6.226, $p < 0.01$), supporting *H7*. This suggests that supply chain resilience fosters trust and collaboration among supply chain partners by enhancing coordination and cooperation, improving relationship performance.

The significance and practical relevance of the structural model were assessed by analyzing the effect sizes (f^2) following Cohen (2013) guidelines. As shown in Table 6, the *H1* demonstrates a small effect size ($f^2 = 0.043$), while the paths from *H4* ($f^2 = 0.122$) and *H5* ($f^2 = 0.051$) also represent small effect sizes. In contrast, the *H2* and *H3* exhibit medium to large

effect sizes, with $f^2 = 0.660$ and $f^2 = 0.720$, respectively, indicating that blockchain adoption has a strong influence on both relational trust and network capability. Furthermore, the $H7$ shows a moderate effect size ($f^2 = 0.225$), suggesting a meaningful impact of supply chain resilience on relationship performance. To further assess the model's predictive relevance, Stone-Geisser's Q^2 values were evaluated through the blindfolding procedure. All endogenous constructs exhibit Q^2 values greater than zero, indicating acceptable predictive quality.

Control variables, including firm age, firm size, internationalization, and ownership, were not statistically significant, indicating that these factors did not influence the primary relationships studied. This result may be partly explained by the relatively homogeneous distribution of the sample across these dimensions. For example, most firms in our sample have over 100 employees, around 80% aged between 7 and 25 years, and most are domestically owned or private enterprises, limiting variation. Additionally, the influence of these structural variables may be overshadowed by more proximate relational and technological factors (e.g., trust, blockchain capability), which play more direct roles in shaping supply chain resilience and relationship outcomes in digitally mediated environments.

Insert Table 6 here.

Table 6. PLS path coefficients and results.

5.4 Assessments of indirect and interaction effects

The indirect effects were assessed based on the procedures recommended by Hair and Alamer (2022). Since there was no value of zero in the indirect effect's confidence intervals (LB: 0.148, UB: 0.301), the results (Table 6) demonstrate that $H6a$ is supported. The outcome suggests that the mediating role of relational trust in the relationship between blockchain adoption and supply chain resilience is statistically significant. Similarly, the $H6b$ was also significant, with a standardized indirect effect of 0.115 and a confidence interval of 0.063 to 0.177, again not containing zero. This supports the conclusion that network capability positively mediates the relationship between blockchain adoption and supply chain resilience.

Although the interaction term between IOS adaptability and supply chain resilience significantly predicted relationship performance ($\beta = -0.241$, t -value = 4.228, $p < 0.01$), the negative path coefficient did not support $H8$. This unexpected result suggests that higher IOS adaptability may not continually strengthen the effect of supply chain resilience on relationship performance. Figure 2 illustrates the interaction effect between IOS adaptability and supply

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chain resilience on relationship performance. The interaction plot shows that while supply chain resilience has a positive effect on relationship performance across all levels of IOS adaptability, the strength of this effect decreases as IOS adaptability increases. Contrary to the hypothesis, this suggests an adverse moderation effect.

From a boundary object perspective, while adaptable IOS platforms bridge knowledge and coordination gaps, excessive adaptability may undermine standardization and mutual understanding across partners (Carlile, 2004). High adaptability may lead to coordination ambiguity, especially when firms interpret or configure systems differently, weakening the positive effect of resilience on relational outcomes. Consistent with the relational view, resilient supply chains rely on trust, shared routines, and stable governance (Dyer & Singh, 1998). However, highly adaptable IOS systems may shift coordination from interpersonal interaction to system-mediated exchange, eroding interpersonal trust and reducing the relational rent generated through human-level collaboration (Faruquee et al., 2021). This reflects a technology reliance paradox, wherein greater digital flexibility replaces, rather than complements, social capital. Moreover, misalignment between IOS adaptability and partners' absorptive capacity or technological maturity may cause friction. Partners with weaker technical capabilities may struggle to adjust to frequent IOS reconfigurations, causing operational overload, reduced responsiveness, and ultimately lower relationship performance (Zhou et al., 2024). Finally, implementation-phase factors may play a role. Firms in the early stages of IOS deployment may face learning curves and integration mismatches, which temporarily offset the potential relational benefits of resilience. Differences in IOS usage maturity between partners may lead to expectation mismatches and coordination breakdowns. These observations suggest boundary conditions under which IOS adaptability may weaken, rather than strengthen, the relational benefits of resilience. Such conditions include undermining standardization and mutual understanding, substituting for interpersonal trust, and exceeding partners' technological or organizational readiness. These results clarify that the theoretical applicability of the relational view and the boundary object perspective is contingent upon the alignment of technological adaptability with relational governance and partners' implementation capacity.

Insert Figure 2 here.

Figure 2. Interorganizational systems adaptability x Supply chain resilience.

5.5 Predictive assessment

The *PLSpredict* approach was employed to evaluate the predictive significance of the model (Chin et al., 2020; Shmueli et al., 2019). A model is considered predictive quality when the $Q^2_{predict}$ values are greater than a zero threshold, as shown in Table 7 (Shmueli et al., 2019). All $Q^2_{predict}$ values for the indicators of the endogenous constructs were greater than zero, indicating that the model demonstrates fundamental predictive relevance. Regarding root mean square error (RMSE), most indicators across the constructs showed lower RMSE values in the PLS-SEM model compared to the linear model (LM). The PLS-SEM model outperformed the LM model on most indicators for all the endogenous constructs, indicating medium predictive power. While the model does not exhibit strong predictive power across all constructs, the results provide sufficient evidence of predictive validity, particularly compared to naïve benchmarks. This supports the model's practical value in predicting new observations and informs its potential application in managerial and strategic contexts.

Insert Table 7 here.

Table 7. *PLSpredict* results.

6. Discussion

6.1 Theoretical contributions

This study makes several significant theoretical contributions to blockchain technology and supply chain management literature. First, this study advances supply chain management theory by shifting the explanatory focus from technical attributes, firm resources, and capabilities to the relational mechanisms through which digital technologies shape supply chain outcomes. While previous research has primarily focused on the efficiency and transparency benefits of blockchain technology (Huzaifa, 2024; Vazquez Melendez et al., 2024), our study extends the theoretical understanding by elucidating the role of blockchain in enhancing supply chain resilience and relationship performance. Our evidence indicates that blockchain contributes to this capability not merely via transparency or efficiency, but by strengthening relational trust and network capability that coordinate resources across firm boundaries, thereby connecting resilience to relationship performance. In this sense, blockchain is reframed from a process technology to a governance and coordination infrastructure within supply networks, broadening supply chain management theorizing from resource and capability-based accounts to a relational mechanism perspective on resilience and inter-organizational

performance.

Second, this study advances the relational perspective by situating blockchain within inter-organizational governance rather than as an efficiency-oriented technology. Relational theory emphasizes that inter-firm rents arise from trust, resource orchestration, and appropriate governance across boundaries (Dyer & Singh, 1998; Dyer et al., 2018; Lavie, 2006). Consistent with this view, the evidence suggests that blockchain is associated with higher relational trust and network capability, and that these mechanisms transmit their effects to resilience, redirecting attention from transactional transparency to partner-embedded routines. Furthermore, the analysis of supply chain resilience extends the applicability of the relational perspective by revealing its dual role as both a capability and a relational asset. Supply chain resilience functions as a dynamic capability for coping with uncertainty, while, when embedded in partner governance and shared routines, it also operates as a relational asset that supports relationship performance. This positioning complements classical accounts that emphasize firm-level efficiency by locating resilience within inter-firm value creation (Belhadi et al., 2024; Jiang et al., 2023; Shen & Sun, 2023), thereby extending the assessment of resilience beyond financial outcomes to a relational framework for understanding collaborative performance in supply chain management.

Lastly, drawing on the boundary object perspective, this study extends the theoretical understanding of the interactive effect between IOS adaptability and supply chain resilience, revealing the context-dependent and double-edged nature of IOS adaptability. Contrary to expectations, IOS adaptability may not strengthen; instead, it weakens the positive relationship between supply chain resilience and relationship performance by increasing operational complexity and coordination costs. One explanation for this counterintuitive finding is that excessive IOS adaptability may lead firms to over-rely on digital systems for coordination, thereby reducing interpersonal communication and informal governance routines that are essential in resilient supply chains. From the relational view, such overreliance may substitute for trust-based mechanisms, eroding the relational capital that underpins performance (Dyer & Singh, 1998). In this sense, IOS adaptability may inadvertently replace rather than complement trust and joint problem-solving. Additionally, the flexibility of highly adaptable IOS can increase information volume and system reconfigurations, resulting in information overload and misalignment in process execution between firms (Shmueli et al., 2019). This reflects a key tension within the boundary object perspective: while IOS bridges knowledge gaps, excessive configurability can reduce semantic clarity and mutual understanding, especially when partners vary in technological maturity or implementation stage (Carlile, 2004). These

coordination difficulties may become more salient under conditions of external disruption. This study extends the relational view and boundary object perspective in a context-sensitive manner, highlighting the importance of aligning technological systems with relational governance to maximize supply chain resilience benefits.

6.2 Practical implications

This study offers valuable insights for managers and policymakers seeking to enhance supply chain resilience and relationship performance through the use of blockchain technology. For practitioners in the manufacturing sector, particularly in emerging markets such as China, our findings underscore the importance of leveraging blockchain technology for its operational efficiencies and its capacity to enhance trust and collaboration among supply chain partners. Managers should consider integrating blockchain solutions into their supply chain management practices to foster greater transparency, data integrity, and cooperation. This integration can significantly enhance the resilience of supply chains, making them more adaptable to market disruptions and changes.

Moreover, managers must recognize that blockchain alone cannot deliver these benefits; strengthening supply chain relationships is equally essential to realizing the value of technological investments. Building trust-based relationships with supply chain partners enables firms to leverage blockchain-enabled information and insights for strategic decision-making. Managers should invest in training and development programs that foster collaboration skills and promote a culture of trust and openness across organizational boundaries. Still, different blockchain applications may influence relational dynamics in distinct ways. For example, traceability solutions enhance transparency and accountability, reducing opportunistic behavior and fostering trust. In contrast, smart contracts automate transactions and enforce agreements, potentially minimizing the need for relational monitoring and introducing rigidity when informal coordination or flexibility is required. Managers should carefully assess which blockchain functionalities align with their relational governance structures and design implementation strategies accordingly to avoid unintended relational consequences.

Furthermore, managers should ensure that inter-organizational systems' design and implementation explicitly support flexibility and relational coordination. For example, systems can be configured to include collaborative dashboards, customizable communication modules, and shared decision logs that reinforce interpersonal trust alongside system-mediated

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coordination. In addition, firms can establish joint governance mechanisms such as co-developed operating protocols or shared data access policies to align expectations and responsibilities between partners. These concrete practices can help managers balance technological adaptability with relational cohesion, maximizing the resilience benefits of blockchain integration.

At the policy level, stakeholders in emerging economies can play a crucial role in promoting the adoption of blockchain technology and fostering a collaborative environment. Policymakers should create supportive regulations and incentives encouraging firms to invest in blockchain technologies and develop robust, trust-based supply chain relationships. By facilitating cross-industry collaborations and establishing standards for blockchain use, policymakers can help create a more resilient and transparent supply chain ecosystem. This, in turn, can drive broader economic benefits by improving the overall efficiency and stability of supply chains in the region.

6.3 Limitations and future research

First, we used a cross-sectional, self-reported dataset from Chinese manufacturing firms, which may introduce perceptual bias. Future studies could integrate objective and subjective measures for greater validity and adopt longitudinal designs to capture the temporal evolution of trust, collaboration, and resilience in supply chains. Another limitation is the non-significant effects of control variables. Their limited variation likely reduced explanatory power. Future studies with more diverse samples, including small or early-stage firms, international ventures, and varied ownership structures, could better identify the boundary conditions of our findings. Second, this study focused on manufacturing firms in China, an emerging market with unique economic, regulatory, and cultural characteristics. Although China is a key player in global supply chains, future studies should replicate these findings in other regions, including advanced and emerging markets, to enhance generalizability. Moreover, the sample was concentrated in electronics and machinery, without explicitly differentiating supply chain roles. This industry concentration and role ambiguity may limit the applicability of our findings to other sectors or supply chain positions. Future research could adopt more balanced samples and classify supply chain roles to explore potential heterogeneity in blockchain adoption and relational outcomes. Finally, this study primarily employed quantitative methods to analyze the impact of blockchain technology on supply chain management, and it opens an essential avenue for extending this line of inquiry to other emerging technologies, particularly generative AI.

Given that generative AI can model and optimize role-specific decision-making, future studies should explicitly compare whether its effects mirror or surpass blockchain's across different supply chain positions.

7. Conclusion

By integrating the relational view and boundary object perspective, we surveyed 251 Chinese manufacturing firms to examine how blockchain fosters inter-firm relationships, enhancing supply chain resilience and performance. Our findings shift the focus from blockchain's technical benefits to its relational dynamics, offering empirical evidence from an emerging market. We also reveal the moderating role of inter-organizational system adaptability between supply chain resilience and relationship performance. This finding further enriches the understanding of the role of inter-organizational system adaptability. This study provides an integrating framework for future research, promoting in-depth exploration of the complex relationship between technology implementation and relational dynamics in operations.

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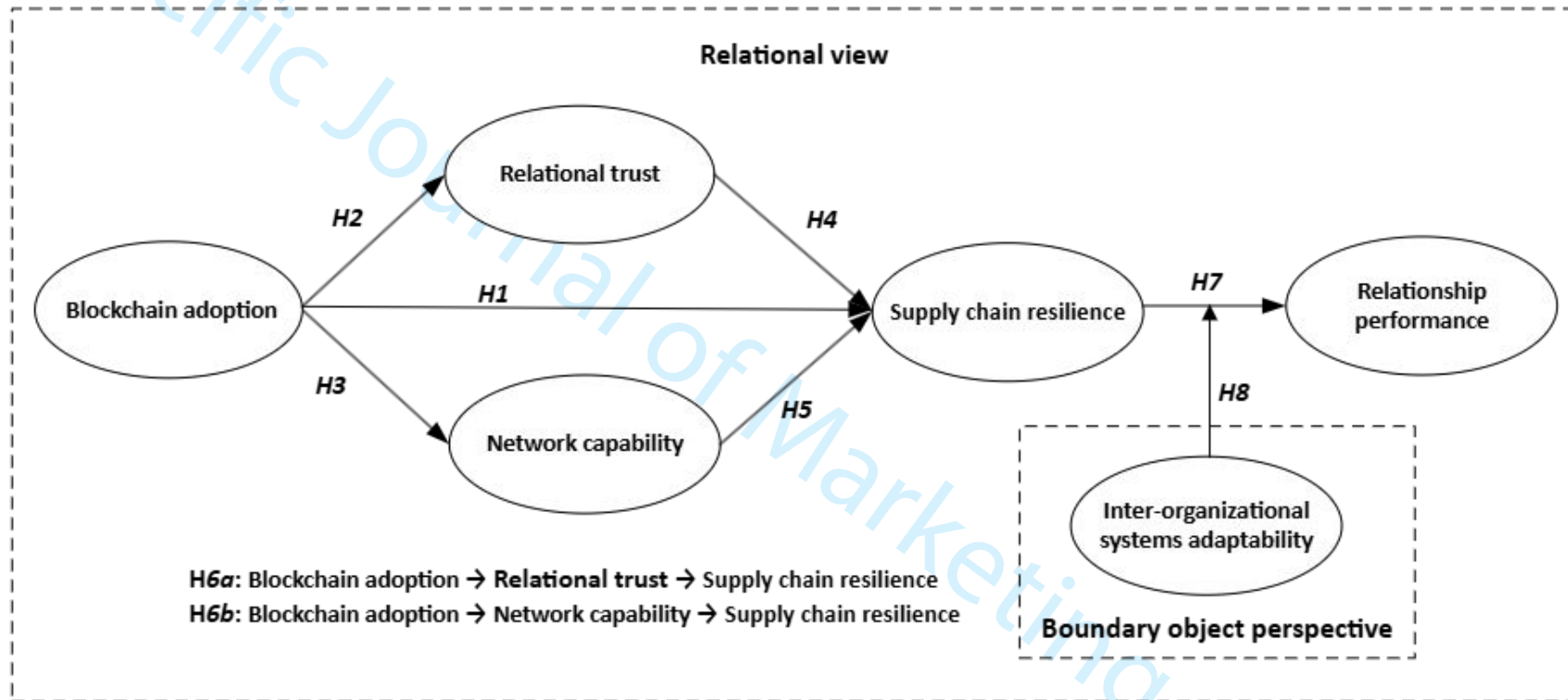
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**Blockchain-driven Supply Chain Resilience and Performance from a Relational
Perspective: The Role of Inter-organizational Relationship and Systems
Adaptability**

Figures and Tables



Source(s): Authors' own work.

Figure 1. Conceptual model

Table 1. Sample characteristics.

Characteristics	Numbers	Percentage
<i>Industry types</i>		
Electronics and electrical appliances	79	31.4%
Metal, machinery and engineering	77	30.6%
Food, beverages, alcohol and tobacco	17	6.7%
Pharmaceutical industry	17	6.7%
Building materials	16	6.3%
Textiles and clothing	16	6.3%
Chemicals and petrochemicals	12	4.7%
Rubber and plastics	6	2.3%
Other	5	1.9%
Wood and furniture	4	1.5%
Arts and crafts	1	0.3%
Publishing and printing	1	0.3%
<i>Firm age</i>		
3 years and under	2	0.7%
4-6 years	6	2.3%
7-15 years	97	38.6%
16-25 years	105	41.8%
26-40 years	35	13.9%
Over 40 years	6	2.3%
<i>Employee numbers</i>		
100 and under	15	5.9%
101-500	81	32.2%
501-1000	79	31.4%
1001-5000	56	22.3%
5001-10000	11	4.3%
10001-30000	6	2.3%
Over 30000	3	1.1%
<i>Type of Ownership</i>		

State-owned or state-controlled	24	9.5%
Private (Mainland China)	200	79.6%
Sino-foreign joint venture	18	7.1%
Wholly foreign-owned	9	3.5%
<i>Degree of Internationalization</i>		
No Internationalization	35	13.9%
Low Degree of Internationalization	112	44.6%
Moderate Degree of Internationalization	96	38.2%
High Degree of Internationalization	8	3.1%

Source(s): Authors' own work.

Table 2. Confirmatory factor analysis on measures.

Variables and Measure items	Loadings	CR	CA	AVE
<i>Blockchain adoption</i>		<i>0.847</i>	<i>0.844</i>	<i>0.616</i>
BA1: We use blockchain technology to share information with supply chain partners	0.779			
BA2: We use blockchain technology as it helps to maintain confidentiality, integrity, and availability of the data	0.816			
BA3: We use blockchain technology to improve supply chain transparency	0.755			
BA4: We routinely use blockchain technology as a data platform that traces the origins, use, and destination of products	0.780			
BA5: We routinely use blockchain technology to avoid unreliable information	0.793			
<i>Supply chain resilience</i>		<i>0.869</i>	<i>0.866</i>	<i>0.651</i>
SCR1: Our firm’s supply chain can adequately respond to unexpected disruptions by quickly restoring its product flow	0.792			
SCR2: Our firm’s supply chain can quickly return to its original state after being disrupted	0.814			
SCR3: Our firm’s supply chain can move to a new, more desirable state after being disrupted	0.802			

SCR4: Our firm's supply chain is well prepared to deal with the financial outcomes of potential supply chain disruptions	0.782			
SCR5: Our firm's supply chain can maintain the desired level of control over structure and function at the time of disruption	0.843			
<i>Relationship performance</i>		0.838	0.837	0.606
RP1: Our firm has policies that reflect respect for industrial customers	0.756			
RP2: Our firm needs to stay as a faithful supply chain partner to our industrial clients because we take pride in being related to an organization that acclimatizes to technological changes	0.735			
RP3: In our relationship, our firm shares confidential information with our industrial partners, who also share reliable information	0.830			
RP4: Our firm interacts regularly with our existing industrial partners	0.778			
RP5: If our firm had to do the business again, we would still choose to connect with our existing industrial partners	0.790			
<i>Network capability</i>		0.732	0.731	0.553
NC1: Our firm analyzes what we would like to achieve with our partners	0.760			
NC2: Our firm discusses with partners regularly how to support each other to achieve success	0.759			
NC3: Our firm can deal flexibly with our partners	0.723			

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NC4: Our firm almost always solves problems constructively with our partners	0.733			
<i>Relational trust</i>		0.869	0.806	0.651
RT1: Our firm and partners have a shared relationship, and we can freely share ideas, feelings, and expectations.	0.820			
RT2: Our firm can talk about difficulties, and our partners will freely listen	0.784			
RT3: Our firm and partners would feel a sense of loss if we could no longer work together	0.703			
RT4: If our firm shared problems with our partners, they would respond constructively and caringly	0.806			
<i>Interorganizational systems adaptability</i>		0.791	0.788	0.703
IOSD1: Both partners can make adjustments in the joint information system to cope with changing economic circumstances or vulnerable customer demands	0.832			
IOSD2: Together, we have developed processes to increase flexibility in our joint information systems in response to customer requests	0.817			
IOSD3: We can make adjustments in our joint information system to accommodate changing circumstances	0.865			

Source(s): Authors’ own work.

Table 3. Measured latent marker variable (MLMV).

Variables	Correlation with MV	<i>p</i> -value	Path	β without MV	β with MV
Blockchain adoption	0.079	0.216	BA → SCR	0.209***	0.207***
			BA → RT	0.630***	0.632***
			BA → NC	0.647***	0.646***
Relational trust	-0.021	0.377	RT → SCR	0.354***	0.355***
Network capability	0.013	0.420	NC → SCR	0.233***	0.232***
Supply chain resilience	0.019	0.352	SCR → RP	0.416***	0.416***
Relationship performance	0.006	0.453			
Interorganizational systems adaptability	0.064	0.216	IOSD x SCR → RP	-0.241	-0.241

Note: BA = Blockchain adoption; RT = Relational trust; NC = Network capability; SCR = Supply chain resilience; RP = Relationship performance; IOSD = Inter-organizational systems adaptability. ***: $p < .01$; **: $p < .05$; *: $p < 0.10$. The path coefficients before and after controlling for the marker variable are reported to assess potential CMV (Chin et al., 2013; Koay et al., 2021).

Source(s): Authors' own work.

Table 4. Correlations between the variables.

Variables	1	2	3	4	5	6
1. Blockchain adoption						
2. Interorganizational systems adaptability	0.518					
3. Network capability	0.647	0.511				
4. Relationship performance	0.577	0.437	0.598			
5. Relational trust	0.630	0.468	0.651	0.602		
6. Supply chain resilience	0.583	0.457	0.598	0.535	0.637	

Source(s): Authors’ own work.

Table 5. Discriminant validity - HTMT criterion and Fornell-Larcker criterion.

Variables	1	2	3	4	5	6
1. Blockchain adoption	0.758	0.518	0.647	0.577	0.630	0.583
2. Interorganizational systems adaptability	0.635	0.838	0.511	0.437	0.468	0.457
3. Network capability	0.821	0.672	0.744	0.598	0.651	0.598
4. Relationship performance	0.683	0.537	0.764	0.778	0.602	0.535
5. Relational trust	0.756	0.585	0.846	0.734	0.796	0.637
6. Supply chain resilience	0.672	0.551	0.750	0.625	0.756	0.807

Note: The HTMT result appears below the diagonal value, the Fornell-Larcker criterion is applied to the result above.

Source(s): Authors' own work.

Table 6. PLS path coefficients and results.

Relationship	Std Error	Std Beta	<i>t</i> -value	<i>p</i> -value	BCa CI 95%		VIF	<i>f</i> ²	<i>R</i> ²	<i>Q</i> ²
					LB	UB				
Direct										
H1: BA → SCR	0.072	0.209	2.904	0.002	0.070	0.350	1.979	0.043	0.486	0.308
H2: BA → RT	0.047	0.630	13.503	0.000	0.531	0.715	1.000	0.660	0.397	0.246
H3: BA → NC	0.046	0.647	14.154	0.000	0.543	0.727	1.000	0.720	0.419	0.227
H4: RT → SCR	0.058	0.354	6.076	0.000	0.231	0.460	1.995	0.122		
H5: NC → SCR	0.067	0.233	3.479	0.001	0.095	0.359	2.068	0.051		
H7: SCR → RP	0.067	0.416	6.226	0.000	0.282	0.544	1.264	0.225	0.393	0.226
Indirect*										
H6a: BA → RT→ SCR	0.039	0.223	5.775	0.000	0.148	0.301				
H6b: BA → NC→ SCR	0.042	0.150	3.824	0.000	0.063	0.231				
Interaction										
H8: IOSD x SCR→ RP	0.057	-0.241	4.228	0.000	-0.360	-0.135				
Control variables										
Firm age → RP	0.060	0.004	0.058	0.477	-0.097	0.102				
Firm size → RP	0.060	0.035	0.593	0.277	-0.063	0.134				
Internationalization → RP	0.050	0.021	0.426	0.335	-0.062	0.104				

Ownership → RP	0.081	-0.015	0.182	0.428	-0.157	0.108
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Note: BA = Blockchain adoption; RT = Relational trust; NC = Network capability; SCR = Supply chain resilience; RP = Relationship performance; IOSD = Inter-organizational systems adaptability. *= The indirect effect is tested using a two-tailed test with a 97.5 % percentile confidence interval, while the rest is tested using a one-tailed test with a 95% percentile confidence interval.

Source(s): Authors' own work.

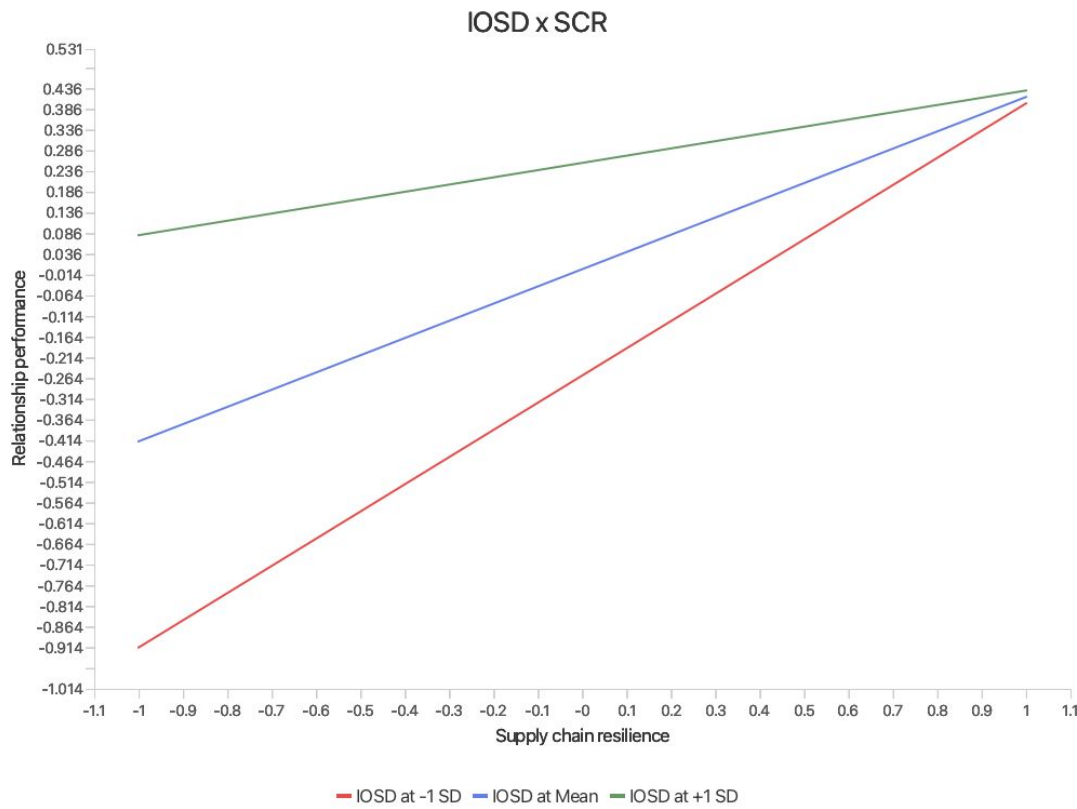


Figure 2. Interorganizational systems adaptability x Supply chain resilience.

Source(s): Authors' own work.

Table 7. PLS*predict* results.

Construct	Item	$Q^2_{predict}$	PLS <i>predict</i>		Decision
			PLS- SEM_RMSE	LM_RMSE	
RT	RT1	0.309	0.782	0.765	Medium predictive power
	RT2	0.235	0.916	0.919	
	RT3	0.184	0.877	0.884	
	RT4	0.243	0.818	0.835	
NC	NC1	0.229	0.707	0.703	
	NC2	0.243	0.759	0.762	
	NC 3	0.221	0.747	0.765	
	NC4	0.200	0.747	0.752	
SCR	SCR1	0.164	0.878	0.882	
	SCR2	0.224	0.902	0.903	
	SCR3	0.189	1.091	1.070	
	SCR4	0.192	0.810	0.812	
	SCR5	0.282	0.808	0.804	
RP	RP1	0.160	0.832	0.847	
	RP2	0.173	0.788	0.787	
	RP3	0.227	0.868	0.869	
	RP4	0.187	0.758	0.764	
	RP5	0.196	0.831	0.840	

Notes: $Q^2_{predict}$ = Predictive relevance; LM = Linear model; RMSE= Root mean square error; RT = Relational trust; NC = Network capability; SCR = Supply chain resilience; RP = Relationship performance.

Source(s): Authors' own work.