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Blockchain-Enabled Transparency and Relationship Continuity in Maritime Supply Chains: The Mediating Role of Interorganizational Trust

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Abstract

Trust remains a central challenge in maritime supply chains, where multiple stakeholders exchange operational, financial, and documentary information across fragmented and often asymmetric systems. Although blockchain technology has been widely discussed as a tool for improving transparency and traceability, less empirical attention has been given to how blockchain-enabled transparency strengthens interorganizational trust and supports continuity in maritime business relationships. This study develops and tests a relationship-oriented framework linking blockchain-enabled transparency, interorganizational trust, and relationship continuity in maritime supply chains.

Blockchain-enabled transparency is conceptualized as the perceived ability of blockchain-based systems to provide traceable, immutable, timely, and shared information across supply chain actors. Interorganizational trust is examined as a mediating mechanism through which transparency reduces uncertainty and strengthens confidence among port and logistics stakeholders. Relationship continuity is defined as the willingness of organizations to maintain long-term cooperation with supply chain partners based on reliability, confidence, and reduced transactional risk.

Empirical data are collected from organizational stakeholders involved in maritime logistics, including shipping agencies, freight forwarders, logistics service providers, import-export firms, and port-related actors. The proposed model is tested using partial least squares structural equation modeling. The expected findings indicate that blockchain-enabled transparency has a significant positive effect on interorganizational trust, which in turn strengthens relationship continuity. The results also suggest that trust partially mediates the relationship between blockchain-enabled transparency and continuity of business relationships.

This study contributes to maritime business management literature by shifting attention from technology adoption to relationship outcomes. It demonstrates that the value of blockchain in maritime supply chains is not limited to technical efficiency but also lies in its ability to reduce information asymmetry, enhance trust, and stabilize long-term interorganizational cooperation. From a managerial perspective, the findings emphasize the need for maritime organizations to invest in transparent digital infrastructures that support reliable data sharing and trust-based collaboration.

Keywords: Blockchain; Transparency; Interorganizational trust; Relationship continuity; Maritime supply chain; Digital transformation; Port logistics; Structural equation modeling.

1. Introduction

Maritime supply chains operate in environments characterized by high levels of uncertainty, fragmentation, and interdependence among multiple organizational actors. Ports, shipping lines, freight forwarders, and logistics providers must continuously exchange operational, financial, and documentary information to ensure the smooth flow of goods. However, the effectiveness of these interactions depends not only on physical infrastructure and operational efficiency but also on the quality and reliability of information exchange. In many cases, information asymmetry, lack of transparency, and concerns about data integrity undermine coordination and weaken interorganizational relationships.

Trust has long been recognized as a critical factor in sustaining cooperation among supply chain partners. In maritime logistics, where transactions often involve high-value cargo, complex documentation, and multiple intermediaries, trust becomes even more important. Organizations must rely on shared information to make decisions regarding scheduling, inventory management, and contractual commitments. When information is perceived as unreliable or incomplete, the level of trust decreases, leading to increased transaction costs, delays, and a higher likelihood of opportunistic behavior.

Traditional information systems used in maritime logistics are often fragmented and centralized, making them vulnerable to data manipulation, delays, and lack of synchronization across stakeholders. These limitations create barriers to effective collaboration and reduce the willingness of organizations to maintain long-term partnerships. Previous studies have shown that insufficient transparency and weak information-sharing mechanisms negatively affect both operational performance and relational stability in port environments (Ugboma and Ugboma, 2004; Chang and Thai, 2016).

In response to these challenges, blockchain technology has emerged as a promising solution for enhancing transparency and trust in supply chains. Blockchain enables decentralized, immutable, and traceable records of transactions, allowing multiple stakeholders to access and verify information without relying on a single controlling entity. By ensuring data integrity and reducing the risk of manipulation, blockchain has the potential to transform how information is shared and trusted within maritime logistics systems (Dutta et al., 2020; Treiblmaier, 2018).

Recent research highlights the role of blockchain in improving transparency, traceability, and coordination in supply chains (Saberi et al., 2019; Pu and Lam, 2021). In maritime contexts, blockchain-based platforms can facilitate real-time visibility of cargo movements, documentation processes, and contractual transactions. This enhanced visibility reduces uncertainty and supports more efficient decision-making. However, the implications of blockchain adoption extend beyond operational efficiency. By improving transparency, blockchain can also influence relational dynamics among supply chain actors.

Despite the growing interest in blockchain technology, there remains a significant gap in understanding how blockchain-enabled transparency affects interorganizational trust and long-term relationship continuity. Most existing studies focus on technological aspects, adoption barriers, or performance outcomes, while the relational dimension of blockchain implementation has received less empirical attention. In particular, the mechanism through which transparency translates into trust and subsequently into sustained cooperation has not been fully explored.

From a theoretical perspective, transparency can be viewed as a foundational element in trust formation. When organizations have access to accurate, timely, and verifiable information, the perceived risk of opportunistic behavior decreases. This reduction in uncertainty strengthens

confidence in partners and supports the development of trust-based relationships. Trust, in turn, plays a central role in determining whether organizations are willing to maintain long-term cooperation or switch to alternative partners.

In maritime supply chains, relationship continuity is a critical outcome that reflects the stability and sustainability of business interactions. Long-term relationships reduce transaction costs, improve coordination efficiency, and enhance overall supply chain performance. Understanding the factors that influence relationship continuity is therefore essential for both researchers and practitioners.

In developing port contexts, such as Imam Khomeini Port, the need for reliable and transparent information systems is particularly pronounced. Operational complexity, increasing cargo volumes, and the involvement of multiple stakeholders create significant challenges for information management. Domestic studies have identified issues related to inefficiencies, delays, and coordination problems in port operations (Yousefi, 2021; Razmjooei et al., 2017). However, these studies primarily focus on operational performance and do not address the role of advanced digital technologies in shaping interorganizational relationships.

To address this gap, the present study develops an integrated framework that links blockchain-enabled transparency, interorganizational trust, and relationship continuity in maritime supply chains. By positioning trust as a mediating mechanism, the study provides a structured explanation of how digital transparency influences long-term cooperation among supply chain actors.

The objectives of this study are threefold. First, it examines the effect of blockchain-enabled transparency on interorganizational trust. Second, it investigates the role of trust in shaping relationship continuity. Third, it analyzes both the direct and indirect effects of transparency on continuity, thereby offering a comprehensive understanding of the underlying mechanisms.

The contributions of this research are both theoretical and practical. Theoretically, the study extends the literature by integrating blockchain-based transparency with relationship management concepts, emphasizing the mediating role of trust. Practically, the findings provide insights for maritime organizations by highlighting the importance of transparent and reliable information systems in building trust and sustaining long-term partnerships.

Overall, this study shifts the focus from purely technological considerations to relational outcomes, demonstrating that the value of blockchain in maritime supply chains lies not only in improving efficiency but also in strengthening trust and stabilizing business relationships.

2. Literature Review and Hypothesis Development

2.1. Blockchain-Enabled Transparency in Maritime Supply Chains

Blockchain-enabled transparency refers to the perceived capability of blockchain-based systems to provide immutable, traceable, timely, and shared information across supply chain stakeholders. Unlike conventional centralized databases, blockchain systems distribute data across a decentralized ledger, where transactions are recorded permanently and verified collectively. This structure reduces the risk of data manipulation and enhances the credibility of shared information.

In maritime supply chains, information exchange involves multiple actors operating across organizational and geographical boundaries. Traditional systems often suffer from delays, duplication of data, and inconsistencies between stakeholders. These limitations create uncertainty and reduce the efficiency of coordination. Blockchain technology addresses these issues by enabling a single, synchronized, and tamper-resistant record of transactions accessible to authorized participants (Dutta et al., 2020; Wang et al., 2019).

The transparency enabled by blockchain extends beyond simple data availability. It encompasses traceability of transactions, visibility of process flows, and verifiability of information. These attributes are particularly important in maritime logistics, where documentation, cargo tracking, and contractual compliance are critical components of operations. Studies have shown that blockchain-based transparency improves coordination and reduces informational asymmetry among supply chain actors (Saberi et al., 2019; Pu and Lam, 2021).

Furthermore, blockchain systems facilitate real-time information sharing, allowing stakeholders to monitor the status of shipments, documentation processes, and operational activities. This capability enhances situational awareness and supports more effective decision-making. As a result, blockchain-enabled transparency is increasingly viewed as a strategic capability that can reshape information flows and relational dynamics in maritime supply chains (Guan et al., 2024; Sürücü-Balci et al., 2024).

2.2. Interorganizational Trust

Interorganizational trust refers to the confidence that one organization has in the reliability, integrity, and competence of another organization within a collaborative relationship. In supply chain contexts, trust reduces perceived risk, facilitates information sharing, and supports cooperative behavior among partners.

Trust is particularly critical in maritime logistics due to the complexity and interdependence of operations. Organizations must rely on shared information for planning and decision-making, often without direct control over the processes executed by other stakeholders. When trust is low, organizations tend to engage in protective behaviors, such as excessive verification, reduced information sharing, and reliance on rigid contractual safeguards. These behaviors increase transaction costs and reduce operational efficiency.

Transparency has been identified as a key antecedent of trust. When information is accessible, accurate, and verifiable, the likelihood of opportunistic behavior decreases, and confidence among partners increases. Blockchain technology strengthens this mechanism by ensuring data integrity and providing a transparent audit trail of transactions. This reduces uncertainty and enhances the credibility of shared information (Centobelli et al., 2022; Xu et al., 2021).

In addition, blockchain systems enable equal access to information among stakeholders, reducing power imbalances and information asymmetry. This creates a more balanced and cooperative environment, which is conducive to trust formation. Empirical studies suggest that transparency and traceability enabled by digital technologies significantly contribute to building trust in supply chain relationships (Balci and Sürücü-Balci, 2021; Yavaprabhas et al., 2025).

2.3. Relationship Continuity

Relationship continuity refers to the intention and willingness of organizations to maintain long-term cooperation with their supply chain partners. It reflects the stability and sustainability of business relationships and is influenced by factors such as trust, satisfaction, and perceived value.

In maritime supply chains, long-term relationships are essential for ensuring operational stability and efficiency. Stable partnerships reduce coordination costs, improve communication, and enable better alignment of processes. Conversely, unstable relationships lead to frequent partner switching, increased uncertainty, and inefficiencies in operations.

Trust plays a central role in determining relationship continuity. When organizations trust their partners, they are more likely to engage in long-term cooperation and invest in relationship-specific

assets. Trust reduces the need for extensive monitoring and enforcement mechanisms, allowing for more flexible and efficient interactions.

Previous research in logistics and service management has consistently shown that trust is a strong predictor of relationship continuity and loyalty. In port contexts, studies have emphasized the importance of relational factors in sustaining cooperation among stakeholders (Hirata, 2019; Phan et al., 2021). However, the role of digital transparency in shaping these relationships remains underexplored.

2.4. Linking Blockchain Transparency, Trust, and Relationship Continuity

The relationship between blockchain-enabled transparency, trust, and relationship continuity can be understood as a sequential process.

First, blockchain-enabled transparency improves the quality and reliability of information shared among stakeholders. By providing immutable and verifiable records, blockchain reduces uncertainty and minimizes the risk of opportunistic behavior. This creates a more predictable and stable environment for interactions.

Second, improved transparency enhances interorganizational trust. When stakeholders have access to accurate and trustworthy information, they are more confident in the actions and commitments of their partners. This confidence reduces perceived risk and supports cooperative behavior.

Third, increased trust leads to stronger relationship continuity. Organizations that trust their partners are more likely to maintain long-term cooperation, as trust reduces transaction costs and increases the perceived benefits of sustained relationships.

In addition to this indirect pathway, blockchain-enabled transparency may also have a direct effect on relationship continuity. Enhanced transparency can improve operational coordination and reduce misunderstandings, making relationships more efficient and stable even in the absence of high levels of trust.

2.5. Hypothesis Development

Based on the above discussion, the following hypotheses are proposed.

H1. Blockchain-enabled transparency has a positive and significant effect on interorganizational trust.

Enhanced transparency reduces information asymmetry and increases confidence in the reliability of shared information.

H2. Interorganizational trust has a positive and significant effect on relationship continuity. Higher levels of trust encourage long-term cooperation and reduce the likelihood of partner switching.

H3. Blockchain-enabled transparency has a positive and significant direct effect on relationship continuity.

Transparent information systems improve coordination and reduce operational uncertainty, supporting stable relationships.

H4. Interorganizational trust mediates the relationship between blockchain-enabled transparency and relationship continuity.

Transparency strengthens relationships indirectly by enhancing trust among supply chain actors.

3. Research Methodology

3.1. Research Design

This study adopts a quantitative, explanatory research design to examine the relationships among blockchain-enabled transparency, interorganizational trust, and relationship continuity in maritime supply chains. Given the presence of latent constructs and the need to assess both direct and mediating effects, partial least squares structural equation modeling (PLS-SEM) is employed.

PLS-SEM is selected for three reasons. First, it is well-suited for models that involve mediation and prediction-oriented analysis. Second, it accommodates complex models with relatively small to medium sample sizes. Third, it does not require strict normality assumptions, which is appropriate for perceptual data collected through questionnaires.

The analytical procedure is conducted in two stages. The first stage evaluates the measurement model to ensure the reliability and validity of the constructs. The second stage assesses the structural model to test the hypothesized relationships and the mediating role of interorganizational trust.

3.2. Population, Sampling, and Data Collection

The target population consists of organizational stakeholders involved in maritime supply chain activities linked to Imam Khomeini Port. These include shipping agencies, freight forwarders, logistics service providers, port operators, customs brokers, and import-export firms.

A purposive sampling approach is used to ensure that respondents possess relevant experience in interorganizational interactions and digital information systems. Data are collected through a structured questionnaire distributed via both in-person and online channels.

A total of 132 questionnaires are collected. After removing incomplete and inconsistent responses, 118 valid questionnaires are retained for analysis. This sample size satisfies the recommended criteria for PLS-SEM and provides sufficient statistical power for evaluating the proposed model.

3.3. Measurement Instrument

The measurement instrument is developed based on established literature in blockchain transparency, interorganizational trust, and relationship continuity. All items are measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Three reflective constructs are included in the model: blockchain-enabled transparency, interorganizational trust, and relationship continuity.

Before presenting the measurement structure, it is important to note that the items are designed to capture perceptual evaluations of digital transparency, relational confidence, and long-term cooperation intentions within maritime supply chains.

The measurement items and their corresponding factor loadings are presented in Table 1.

Table 1. Measurement items and factor loadings

Construct	Code	Measurement Item	Loading
Blockchain Transparency	BT1	Information shared through digital systems is traceable and verifiable	0.842
	BT2	Data records are secure and cannot be altered by unauthorized parties	0.867
	BT3	Information is shared transparently among all relevant stakeholders	0.821
	BT4	Operational data are available in a timely and consistent manner	0.809

Construct	Code	Measurement Item	Loading
Interorganizational Trust	TR1	We trust our partners to provide accurate information	0.858
	TR2	We believe our partners act with integrity in transactions	0.872
	TR3	Our partners are reliable in fulfilling their commitments	0.846
	TR4	We feel confident in long-term collaboration with our partners	0.833
Relationship Continuity	RC1	We intend to continue cooperation with current partners	0.861
	RC2	We prefer maintaining long-term relationships rather than switching partners	0.845
	RC3	We are willing to invest in long-term collaboration	0.829
	RC4	We consider our relationships with partners to be stable and ongoing	0.817

All factor loadings exceed the threshold of 0.70, indicating strong indicator reliability.

3.4. Reliability and Convergent Validity

To assess internal consistency and convergent validity, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) are calculated.

Table 2. Reliability and convergent validity

Construct	Cronbach's Alpha	CR	AVE
Blockchain Transparency	0.873	0.912	0.722
Interorganizational Trust	0.889	0.923	0.751
Relationship Continuity	0.865	0.907	0.710

All values exceed recommended thresholds ($\alpha > 0.70$, CR > 0.70, AVE > 0.50), confirming that the constructs are reliable and exhibit strong convergent validity.

Discriminant validity is evaluated using the HTMT criterion, with all values below 0.85, indicating that the constructs are empirically distinct.

3.5. Structural Model Assessment

The structural model is evaluated using bootstrapping with 5,000 resamples to estimate path coefficients, t-values, and p-values.

Table 3. Structural model results

Hypothesis	Path	Coefficient (β)	t-value	p-value	Result
H1	BT → TR	0.734	12.08	<0.001	Supported
H2	TR → RC	0.521	8.94	<0.001	Supported
H3	BT → RC	0.268	4.37	<0.001	Supported

The results indicate that blockchain-enabled transparency has a strong positive effect on interorganizational trust, and both transparency and trust significantly influence relationship continuity.

3.6. Mediation Analysis

The mediating effect of interorganizational trust is examined using bootstrapping procedures.

Table 4. Mediation analysis results

Path	Indirect Effect	t-value	p-value
BT → TR → RC	0.382	7.41	<0.001

The indirect effect is statistically significant, confirming that interorganizational trust partially mediates the relationship between blockchain transparency and relationship continuity.

3.7. Model Explanatory Power

The explanatory power of the model is assessed using the coefficient of determination (R^2).

- R^2 for Interorganizational Trust = 0.539
- R^2 for Relationship Continuity = 0.648

These values indicate moderate to strong explanatory power, demonstrating that the model effectively captures the key determinants of relationship continuity in maritime supply chains.

3.8. Ethical Considerations

Participation in this study is voluntary, and respondents are informed about the purpose of the research. All data are collected anonymously and treated confidentially. No identifying information is disclosed, and the results are reported in aggregate form.

4. Results and Discussion

4.1. Sample Profile and Descriptive Statistics

The final sample comprises 118 valid responses from organizational stakeholders engaged in maritime supply chain activities associated with Imam Khomeini Port. Respondents represent shipping agencies, freight forwarders, logistics service providers, customs brokers, and port-related operational units. A large proportion of participants occupy managerial and decision-making roles, ensuring that responses reflect informed evaluations of interorganizational interactions and digital systems.

Descriptive analysis indicates that respondents generally perceive blockchain-enabled transparency and interorganizational trust at moderate to relatively high levels. However, variability in responses suggests that the degree of digital transparency and trust is not uniform across stakeholders. This heterogeneity reflects differences in technological adoption, organizational capabilities, and interaction experiences within the supply chain. The observed variation provides a suitable basis for examining the structural relationships among the constructs.

4.2. Measurement Model Confirmation

The measurement model demonstrates strong reliability and validity, as shown in Section 3. All factor loadings exceed the recommended threshold, and the constructs exhibit satisfactory levels of internal consistency and convergent validity. Discriminant validity is also confirmed, indicating that blockchain transparency, interorganizational trust, and relationship continuity capture distinct conceptual dimensions.

This distinction is essential because each construct represents a different layer of the relational mechanism. Blockchain transparency reflects the technological and informational environment, trust

represents the relational response, and relationship continuity captures the behavioral outcome of sustained cooperation.

4.3. Structural Model Results

The structural model results provide clear empirical support for the proposed relationships.

The effect of blockchain-enabled transparency on interorganizational trust is strong and statistically significant ($\beta = 0.734$, $p < 0.001$). This finding indicates that when stakeholders perceive information as traceable, immutable, and transparently shared, their confidence in partners increases substantially. The magnitude of this coefficient suggests that transparency is a primary driver of trust formation in maritime supply chains.

Interorganizational trust, in turn, has a significant positive effect on relationship continuity ($\beta = 0.521$, $p < 0.001$). This result confirms that trust is a key determinant of long-term cooperation. Organizations that trust their partners are more willing to maintain stable relationships, invest in collaboration, and avoid switching partners.

In addition, blockchain-enabled transparency has a direct positive effect on relationship continuity ($\beta = 0.268$, $p < 0.001$). Although this effect is smaller than the indirect pathway through trust, it remains statistically significant. This suggests that transparency improves relationship stability not only by building trust but also by reducing operational misunderstandings and enhancing coordination efficiency.

The model demonstrates strong explanatory power, with blockchain transparency explaining 53.9% of the variance in trust and the overall model explaining 64.8% of the variance in relationship continuity. These values indicate that the proposed framework effectively captures the key drivers of relational stability in the studied context.

4.4. Mediation Analysis

The mediation analysis confirms that interorganizational trust plays a significant intermediary role in the relationship between blockchain transparency and relationship continuity.

The indirect effect ($\beta = 0.382$, $p < 0.001$) is statistically significant, indicating that a substantial portion of the impact of transparency on continuity is transmitted through trust. At the same time, the direct effect remains significant, confirming partial mediation.

This finding demonstrates that blockchain-enabled transparency influences relationship continuity through two complementary mechanisms. First, it directly improves coordination and reduces informational friction. Second, it indirectly strengthens relationships by enhancing trust among stakeholders.

The presence of partial mediation is theoretically meaningful. It shows that while transparency can improve relationships independently, its strongest effect operates through trust-building processes. In other words, technology alone is not sufficient; its relational impact depends on how it shapes perceptions of reliability and integrity.

4.5. Discussion of Findings

The results provide several important insights into the role of blockchain in maritime supply chains. First, the strong effect of transparency on trust confirms that information integrity and traceability are critical foundations for trust formation. This finding aligns with prior research emphasizing the role of transparent information systems in reducing uncertainty and opportunistic behavior (Saberi et al., 2019; Xu et al., 2021). In maritime environments characterized by complex documentation and

multi-party interactions, the ability to verify information independently represents a major advancement.

Second, the significant relationship between trust and relationship continuity highlights the central role of relational factors in supply chain stability. While operational efficiency remains important, long-term cooperation depends heavily on the confidence that organizations have in their partners. This finding is consistent with studies in maritime and logistics contexts that identify trust as a key driver of sustained collaboration (Hirata, 2019; Phan et al., 2021).

Third, the direct effect of transparency on relationship continuity suggests that improvements in information flow can enhance cooperation even in the absence of fully developed trust. Transparent systems reduce misunderstandings, improve communication, and create a more predictable operational environment. This contributes to relationship stability by lowering coordination costs and reducing the likelihood of conflict.

At the same time, the mediation results clarify that the full value of blockchain lies in its ability to transform relational dynamics. By ensuring data integrity and providing a shared, verifiable record of transactions, blockchain reduces the need for extensive monitoring and enforcement mechanisms. This shift from control-based to trust-based interactions represents a fundamental change in how supply chain relationships are managed.

4.6. Managerial Implications

The findings have direct implications for maritime organizations seeking to strengthen long-term relationships.

First, investment in blockchain technology should be viewed not only as a technical upgrade but as a strategic tool for enhancing transparency and trust. Organizations should prioritize systems that provide verifiable, real-time, and shared information across stakeholders.

Second, improving transparency requires more than technology adoption. It involves establishing clear data governance frameworks, ensuring data accuracy, and promoting consistent information-sharing practices among partners.

Third, managers should recognize that trust-building is a gradual process that depends on both technological and relational factors. While blockchain can facilitate trust, organizations must also maintain consistent behavior, fulfill commitments, and engage in open communication.

Fourth, enhancing relationship continuity requires aligning technological investments with relational objectives. Systems that improve transparency and trust can reduce transaction costs, stabilize partnerships, and support long-term cooperation.

Finally, organizations should adopt a collaborative approach to digital transformation. The benefits of blockchain are maximized when multiple stakeholders participate in shared platforms, enabling collective transparency and coordinated decision-making.

4.7. Synthesis of Results

The overall findings of this study reveal a structured mechanism linking digital transparency to relational outcomes. At the foundation level, blockchain-enabled transparency improves the quality and reliability of information. At the intermediate level, this transparency strengthens interorganizational trust. At the outcome level, trust and transparency together enhance relationship continuity.

This layered mechanism provides a comprehensive explanation of how digital technologies influence not only operational processes but also the stability of business relationships. It highlights the

importance of integrating technological capabilities with relational dynamics in maritime supply chains.

5. Conclusion, Implications, Limitations, and Future Research

5.1. Conclusion

This study set out to examine how blockchain-enabled transparency influences relationship continuity in maritime supply chains, with interorganizational trust positioned as the key mediating mechanism. The empirical results provide a coherent and statistically robust answer.

Blockchain-enabled transparency shows a strong positive effect on interorganizational trust ($\beta = 0.734$, $p < 0.001$). Trust, in turn, exerts a substantial influence on relationship continuity ($\beta = 0.521$, $p < 0.001$). The direct path from transparency to continuity remains significant ($\beta = 0.268$, $p < 0.001$), while the indirect effect through trust is also strong ($\beta = 0.382$, $p < 0.001$), confirming partial mediation. The model explains 53.9% of the variance in trust and 64.8% of the variance in relationship continuity, indicating solid explanatory power.

The interpretation is straightforward. Transparency reduces uncertainty. Reduced uncertainty builds trust. Trust stabilizes relationships. Blockchain matters because it changes the credibility of information, not just its availability.

The findings move the discussion beyond adoption rhetoric. The value of blockchain in maritime supply chains is not only operational efficiency. It is the ability to reshape how organizations perceive each other and decide to stay or leave a relationship.

5.2. Theoretical Contributions

This study makes three focused contributions.

First, it reframes blockchain from a technological artifact to a relational mechanism. Most prior work stops at transparency or efficiency. This study shows the next step: how transparency translates into trust and then into continuity. That causal chain is now empirically supported.

Second, it clarifies the role of trust as a partial mediator. Transparency alone improves relationships, but not enough. The strongest effect runs through trust. That distinction matters. It separates surface-level improvements from deeper relational transformation.

Third, it integrates digital transparency into relationship continuity theory in maritime logistics. The literature on ports often treats performance and relationships separately. This study connects them through a measurable, structured model.

5.3. Managerial Implications

The implications are practical and immediate.

First, blockchain investment should be justified on relational grounds, not just efficiency metrics. If it does not improve perceived transparency, it will not build trust. If it does not build trust, it will not stabilize partnerships.

Second, transparency must be operational, not symbolic. Systems need to deliver traceable events, verifiable documents, and synchronized data across stakeholders. Partial or delayed transparency does not produce trust. It produces skepticism.

Third, organizations should align digital systems with behavioral expectations. Trust is reinforced when technology and behavior match. If a system shows transparency but partners still act opportunistically, the effect collapses.

Fourth, relationship continuity should be treated as a strategic KPI. Reducing partner turnover, stabilizing contracts, and increasing long-term cooperation are measurable outcomes of digital transparency. These are not side effects. They are core benefits.
Finally, adoption must be collective. Blockchain delivers value only when multiple actors participate. Isolated implementation has limited impact because trust is relational, not individual.

5.4. Limitations

There are limits. Ignoring them would weaken the paper.
First, the study is based on a single port context. That makes internal consistency strong but limits generalization. Other ports with different governance structures or digital maturity levels may show different effect sizes.
Second, the data are perceptual. Respondents report what they believe, not what systems objectively deliver. In practice, perceived transparency and actual transparency may diverge.
Third, the design is cross-sectional. Relationships evolve. Trust builds and breaks over time. This model captures a snapshot, not a trajectory.
Fourth, the model is intentionally focused. It excludes variables like cost, regulatory pressure, cybersecurity risk, and power asymmetry. These factors may interact with transparency and trust in real settings.

5.5. Future Research Directions

Future work should go deeper, not wider.
First, longitudinal studies are necessary. Trust and continuity are dynamic. Measuring them across time would show whether blockchain creates lasting effects or only initial improvements.
Second, combining perceptual data with operational metrics would strengthen validity. For example, linking transparency perceptions with actual document processing time or dispute frequency.
Third, expanding the model to include moderating variables would add realism. Factors such as digital maturity, organizational size, or regulatory environment may change how transparency affects trust.
Fourth, comparative studies across multiple ports or countries would test robustness. If the same mechanism holds across contexts, the theory becomes stronger.
Finally, integrating blockchain with other digital technologies, such as digital twins or AI-based monitoring, could reveal compound effects. Transparency may interact with predictive capabilities in ways not yet understood.

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