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Blockchain-Based Information Systems for Enhancing Trust in Digital Trade Ecosystems

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ABSTRACT

The rapid growth of digital trade ecosystems has made establishing trust challenging due to increased complexity, lack of transparency, and reliance on intermediaries. Traditional trust mechanisms like reputation systems, legal contracts, and regulatory oversight often fall short, especially in cross-border or decentralized transactions, increasing risks and limiting efficiency. This study examines how blockchain-based information systems enhance trust by leveraging transparency, immutability, smart contracts, and decentralized verification, while considering the moderating roles of organizational readiness and regulatory compliance. Using a mixed-methods approach—including a literature review, expert interviews, and a survey of 1,015 digital trade participants—quantitative data were analyzed with Structural Equation Modeling and qualitative data through thematic analysis. Results show that transparency and immutability form the foundation of trust via smart contracts, with decentralized verification boosting accountability and impartiality. Organizational readiness and regulatory alignment significantly influence these effects. Overall, blockchain mechanisms strengthen traditional trust methods and open new paths for trust formation, offering practical guidance for implementation and a framework for managing trustworthy, transparent, and accountable digital commerce.

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1. Introduction

Over the past decade, the ubiquity of social media platforms has transformed the digital landscape. The emergence of blockchain-based information systems has fundamentally transformed the ways in which digital trade ecosystems are conceptualized, implemented, and trusted. In contemporary global commerce, where the exchange of information is as crucial as the exchange of goods and services, the question of trust remains a defining challenge. Traditional systems of digital trade have long been dependent on centralized intermediaries to verify transactions, authenticate identities, and ensure compliance with contractual obligations. However, these centralized approaches often suffer from opacity, inefficiency, and vulnerability to fraud or manipulation, thereby undermining the confidence of stakeholders in the broader ecosystem. The integration of blockchain technology into information systems has been widely discussed as a novel solution to these issues, particularly because of its unique capacity to provide transparency, immutability, and decentralized consensus mechanisms that reinforce trust among actors with divergent interests (Tapscott & Tapscott, 2017). Unlike conventional information infrastructures, blockchain operates as a distributed ledger where every transaction is recorded, validated, and preserved across a network of participants without reliance on a single authority. This structural characteristic significantly reduces the possibility of tampering, enhances traceability, and builds a foundation for mutual confidence in digital trade processes (Casino, Dasaklis, & Patsakis, 2019). Trust, in economic exchanges, has always been a multidimensional construct encompassing expectations of honesty, reliability, competence, and fairness among transacting parties. In digital environments, where human interactions are mediated through algorithms and automated platforms, establishing trust becomes more complex because of the absence of physical cues and direct relational mechanisms that traditionally facilitated credibility. Scholars have argued that the erosion of trust in digital trade has often been exacerbated by cases of data breaches, fraudulent activities, and systemic inefficiencies within global supply chains (Saberli, Kouhizadeh, Sarkis, & Shen, 2019). Blockchain-based information systems address these vulnerabilities by embedding trust within the technological architecture itself rather than relying solely on institutional or contractual guarantees. Through smart contracts, cryptographic security, and consensus protocols, blockchain enables parties to engage in digital transactions with reduced uncertainty, thereby creating an environment conducive to sustainable and reliable trade. The relevance of blockchain in enhancing trust is particularly pronounced in cross-border trade ecosystems, where heterogeneity of regulations, diverse cultural norms, and fragmented infrastructures often create friction. In such contexts, the distributed nature of blockchain reduces dependency on localized institutions and offers a standardized, verifiable, and transparent method of recording and validating trade activities across jurisdictions (Kouhizadeh, Saberli, & Sarkis, 2021). Furthermore, the immutability of blockchain records ensures that once data is entered, it cannot be altered without consensus from the network, providing stakeholders with assurance regarding the authenticity and integrity of transactional information. This attribute is vital in international trade, where disputes over documentation, provenance of goods, and contractual compliance are frequent sources of distrust. As digital trade ecosystems increasingly rely on data flows, blockchain-based systems also facilitate the secure exchange of sensitive information. For instance, in supply chain finance, blockchain enables real-time visibility of transactions, credit histories, and trade documents, reducing opportunities for fraud and improving creditworthiness assessments (Huang, Wu, & Long, 2021). In the logistics sector, blockchain supports the tracking of goods from origin to destination, offering transparency to all participants while minimizing disputes about delivery conditions or timelines (Queiroz & Wamba, 2019). These capabilities not only improve operational efficiency but also reinforce trust among trading partners who may otherwise lack direct relational histories. Importantly, blockchain is often characterized as a “trust machine” because it shifts the basis of trust from interpersonal or institutional sources to cryptographic and algorithmic mechanisms that are resistant to manipulation (Beck, Müller-Bloch, & King, 2018).

This reconceptualization of trust has profound implications for the governance of digital trade ecosystems. Rather than depending exclusively on hierarchical enforcement structures, blockchain allows for trust to be distributed and codified in technological protocols that are universally accessible and verifiable. Such a shift reduces asymmetries of information, mitigates power imbalances, and fosters inclusivity by granting smaller actors and developing economies equal access to trustworthy systems of trade. From a theoretical standpoint, blockchain-based information systems also align with socio-technical perspectives of trust, where technological artifacts and human actors co-construct reliable interactions. The embedding of trust in blockchain protocols demonstrates how technical design can serve as a functional substitute for institutional trust, particularly in contexts where regulatory frameworks are weak or unevenly enforced (Iansiti & Lakhani, 2017). Yet, the adoption of blockchain is not without challenges. Issues such as scalability, interoperability, energy consumption, and regulatory uncertainty present barriers that can hinder the realization of blockchain's full potential in digital trade. However, proponents argue that these challenges are transitional and subject to ongoing research, innovation, and standardization efforts (Treiblmaier, 2018). Moreover, the dynamic interplay between technological adoption and regulatory adaptation suggests that as blockchain matures, its integration into digital trade ecosystems will likely become more seamless and widely accepted. In the broader context of global economic transformations, blockchain-based information systems are also seen as catalysts for reconfiguring power relations and value distribution within trade ecosystems. By reducing reliance on intermediaries, blockchain can democratize access to trade opportunities, empower small and medium-sized enterprises, and reduce transaction costs. These outcomes directly enhance trust by leveling the playing field and mitigating risks associated with opportunistic behavior by dominant players (Wang, Han, & Beynon-Davies, 2019). Furthermore, blockchain supports compliance with sustainability standards by providing verifiable data on environmental and social impacts across supply chains, thereby strengthening trust not only among trading partners but also between businesses and consumers (Saber et al., 2019). The ethical and social dimensions of trust in digital trade cannot be overlooked, as modern consumers increasingly demand transparency, accountability, and ethical conduct from firms. Blockchain-based systems provide mechanisms for verifying claims about fair labor practices, sustainable sourcing, and carbon footprints, thus enhancing consumer confidence in digital trade ecosystems. This expanded notion of trust extends beyond transactional assurances and incorporates broader societal expectations about corporate responsibility and governance. As scholars emphasize, trust in the digital age must be understood as both an operational necessity and a strategic asset (Mending, Weber, van der Aalst, Brocke, Cabanillas, Daniel, Debois, 2018). Consequently, blockchain's role in enhancing trust is not limited to securing transactions but also to fostering reputational capital, stakeholder loyalty, and long-term resilience of digital trade ecosystems. Equally important is the recognition that blockchain-based trust mechanisms have psychological and behavioral implications. When stakeholders know that records are immutable, verifiable, and collectively maintained, they are more likely to engage in cooperative behavior and less likely to pursue opportunistic strategies that could undermine the system. This collective trust further stabilizes digital trade ecosystems and encourages innovation because actors can devote resources to value creation rather than monitoring or enforcement. Additionally, blockchain facilitates the emergence of new business models such as decentralized autonomous organizations, tokenized trade assets, and peer-to-peer marketplaces that challenge traditional forms of governance and expand opportunities for trust-based collaboration across borders (Beck et al., 2018). As these models proliferate, the foundational role of blockchain in embedding trust will become even more critical, highlighting its dual character as both a technical infrastructure and a socio-economic enabler. In conclusion, the integration of blockchain-based information systems represents a paradigmatic shift in the architecture of digital trade, addressing long-standing challenges of trust, transparency, and reliability. By embedding trust directly into technological protocols, blockchain diminishes reliance on centralized

authorities, enhances data integrity, and promotes inclusivity across global trade networks. Despite the challenges of implementation, the trajectory of blockchain research and practice suggests that it will continue to play a pivotal role in shaping the trust dynamics of digital trade ecosystems. As the global economy becomes increasingly interconnected and digitalized, the ability to establish, maintain, and enhance trust through blockchain will likely define the competitiveness and sustainability of future trade infrastructures.

2. Literature Review

The growing body of literature on blockchain-based information systems reveals an evolving understanding of how decentralized technologies contribute to the creation of trust in digital trade ecosystems. Much of the early scholarship focused on conceptual frameworks that presented blockchain as a disruptive architecture capable of disintermediating traditional trust brokers such as banks, certification authorities, or governmental bodies, thereby creating what has been referred to as a technological “trust machine” (Beck, Müller-Bloch, & King, 2018). This line of inquiry emphasizes how blockchain transforms the epistemic foundations of trust by making reliability an outcome of cryptographic protocols and distributed consensus rather than institutional enforcement. Subsequent studies advanced this argument by systematically reviewing blockchain adoption in supply chains, financial trade systems, and cross-border commerce, pointing to the way distributed ledgers strengthen information transparency, traceability, and data integrity (Wang, Han, & Beynon-Davies, 2019). Scholars consistently note that trust in trade ecosystems cannot be reduced to technological efficiency alone, but rather emerges as a socio-technical phenomenon where institutional frameworks, cultural practices, and governance structures interact with technological affordances (Queiroz & Wamba, 2019). In this respect, blockchain is seen not merely as an infrastructural innovation but as a catalyst for new governance models and collaborative arrangements among trading partners. Research on blockchain’s role in trade finance emphasizes the importance of transparency in mitigating fraud and duplicate financing. Traditional trade finance processes are heavily document-driven, which often allows for manipulation, forgery, or double spending of trade invoices. By contrast, blockchain’s immutability ensures that once a trade document has been recorded on the ledger, it cannot be altered without network consensus, thus reducing information asymmetry between banks, buyers, and suppliers (Huang, Wu, & Long, 2021). Literature further highlights that blockchain-based trade finance platforms enable real-time verification of invoices, automated execution of payment conditions through smart contracts, and instantaneous auditing capabilities (Chen, Xu, & Jia, 2020). These features substantially strengthen the confidence of financial institutions in extending credit while simultaneously empowering smaller firms that previously suffered from a lack of reliable verification mechanisms. In effect, blockchain serves as a trust enabler that reduces dependency on reputation-based assessments and levels the playing field for less established actors in digital trade. Parallel streams of literature analyze blockchain adoption in global supply chains, where the complexity of multi-tier supplier networks and the global dispersion of production sites exacerbate the risk of opportunistic behavior, quality lapses, and sustainability violations. Studies in this domain underscore how blockchain enables end-to-end traceability by recording each step of a product’s journey from raw material sourcing to final delivery (Saber, Kouhizadeh, Sarkis, & Shen, 2019). Trust in this context arises not simply from data availability but from the verifiability of records shared across multiple parties. For example, provenance information embedded in a blockchain ledger assures downstream partners and end consumers that the product meets safety, ethical, and environmental standards (Kouhizadeh, Saber, & Sarkis, 2021). Moreover, the literature suggests that this enhanced traceability fosters consumer trust, which in turn pressures firms to adopt more responsible practices. The technological assurance provided by blockchain thus integrates with normative dimensions of trust, reinforcing both commercial and ethical accountability in digital trade ecosystems.

Another key theme in the literature concerns the interplay between blockchain and regulatory compliance. Scholars observe that blockchain's ability to maintain tamper-proof records can streamline customs procedures, taxation, and legal auditing by ensuring that documentation is authentic and resistant to manipulation (Casino, Dasaklis, & Patsakis, 2019). In trade environments characterized by fragmented legal regimes, blockchain offers a harmonized infrastructure that reduces disputes and promotes trust across jurisdictions. Yet, studies also caution that without appropriate regulatory frameworks and interoperability standards, the potential of blockchain to create trust can be undermined by legal uncertainty or conflicting national policies (Treiblmaier, 2018). The literature therefore emphasizes that while blockchain provides technological guarantees of trust, institutional adoption and policy alignment remain critical to realizing its full benefits. The social and behavioral dimensions of blockchain-enabled trust are also highlighted in recent research. Scholars argue that blockchain alters the cognitive perception of risk among actors in trade ecosystems. When stakeholders recognize that transactions are transparently recorded and cannot be easily manipulated, they are more inclined to engage in cooperative interactions and less likely to adopt defensive or opportunistic strategies (Beck et al., 2018). This behavioral shift is particularly important in digital ecosystems, where physical distance and anonymity traditionally weaken trust. By providing verifiable digital identities and transaction histories, blockchain reduces the uncertainty associated with anonymous interactions and creates a reputational layer that enhances trust in digital marketplaces (Mendling, Weber, van der Aalst, Brocke, Cabanillas, Daniel, & Debois, 2018). Furthermore, literature increasingly discusses blockchain's potential in promoting sustainable development goals within trade ecosystems. By making supply chain activities more transparent, blockchain empowers consumers and regulators to hold firms accountable for environmental and social impacts. This accountability enhances trust not only between trading partners but also between businesses and society at large (Saberli et al., 2019). Trust in this expanded sense extends beyond transactional reliability to encompass legitimacy and ethical responsibility, indicating a broadening of the trust concept in blockchain research. Emerging research has also explored the integration of blockchain with complementary technologies such as the Internet of Things (IoT), artificial intelligence (AI), and cloud computing to further strengthen trust in digital trade. For instance, IoT devices can automatically record shipment conditions onto a blockchain, ensuring that temperature-sensitive products such as pharmaceuticals or perishable foods are transported under appropriate conditions (Queiroz & Fosso Wamba, 2019). This integration increases trust by coupling real-time monitoring with immutable data storage, reducing disputes about compliance with agreed-upon standards. Similarly, AI-driven analytics applied to blockchain data can enhance predictive capabilities, fraud detection, and risk assessment, further consolidating trust in complex trade ecosystems (Wang et al., 2019). A critical strand of the literature engages with the challenges and barriers to blockchain adoption, noting that trust cannot be assumed as a natural consequence of technology. Concerns about scalability, interoperability, and energy efficiency continue to raise doubts about blockchain's practicality in high-volume trade environments (Treiblmaier, 2018). Moreover, the decentralized nature of blockchain challenges existing governance structures, raising questions about accountability in cases of system failure or malicious attacks. These issues complicate the narrative of blockchain as a trust solution, suggesting instead that trust in digital trade ecosystems is co-constructed by technological, organizational, and institutional factors. Consequently, scholars call for more empirical studies that examine how blockchain adoption reshapes trust dynamics across different cultural and industrial contexts (Kouhizadeh et al., 2021). Overall, the first wave of blockchain-trust literature reveals both optimism and caution. Optimism derives from blockchain's unique capabilities in ensuring data integrity, transparency, and immutability, which directly address long-standing vulnerabilities in digital trade ecosystems. Caution emerges from the recognition that blockchain is not a panacea, and that the creation of trust depends equally on regulatory, social, and organizational adaptations. Literature thus converges on the view that blockchain-based information systems are best understood as

trust-enabling infrastructures whose effectiveness is contingent on broader ecosystem alignment. Building on earlier discussions, subsequent literature emphasizes the role of blockchain in reinforcing trust through network effects and collaborative governance mechanisms in digital trade ecosystems. Scholars note that trust is not solely a dyadic phenomenon between two transacting parties, but a network-level property that emerges from shared verification, consensus, and transparency across multiple actors (Beck, Avital, Rossi, & Thatcher, 2017). In global supply chains, where suppliers, distributors, logistics providers, and customers interact across heterogeneous systems and jurisdictions, blockchain's capacity to provide a unified, immutable ledger strengthens collective trust. Research demonstrates that this networked trust reduces transactional friction, accelerates decision-making, and enhances operational resilience, particularly in volatile or uncertain market environments (Wang, Han, & Beynon-Davies, 2019). The literature further suggests that blockchain's decentralized architecture democratizes access to trustworthy information, mitigating traditional power asymmetries between large multinational corporations and smaller enterprises. This decentralization encourages broader participation in trade networks and fosters inclusivity by enabling even actors with limited reputational history to engage confidently in transactions (Queiroz & Wamba, 2019). Empirical studies investigating blockchain adoption in various industries reveal diverse mechanisms through which trust is operationalized. In the context of pharmaceutical supply chains, researchers found that blockchain-enabled provenance tracking and anti-counterfeit measures significantly increased trust among manufacturers, distributors, and regulatory authorities (Huang, Wu, & Long, 2021). Similarly, studies in the agri-food sector highlight how blockchain facilitates verifiable claims regarding product origin, organic certification, and compliance with safety standards, thereby enhancing both B2B trust and consumer confidence (Saber et al., 2019). These studies converge on the notion that blockchain acts as a trust mediator, particularly in contexts where traditional institutional enforcement is weak or fragmented. Literature also explores the interplay between blockchain and smart contracts as instruments for trust automation. Smart contracts, which are self-executing digital agreements encoded on a blockchain, minimize the need for intermediaries by ensuring that contract conditions are automatically verified and enforced (Christidis & Devetsikiotis, 2016). Scholars argue that smart contracts reduce counterparty risk, prevent opportunistic behavior, and establish procedural fairness, thereby creating a predictable and transparent environment conducive to trust (Chen et al., 2020). Studies further indicate that the combination of smart contracts with real-time IoT data feeds can dynamically adjust contractual obligations based on shipment status, environmental conditions, or quality metrics, enhancing trust through continuous verification and reducing disputes (Queiroz & Fosso Wamba, 2019). Another emerging theme in the literature concerns the psychological dimensions of blockchain-mediated trust. Researchers highlight that blockchain affects perceptions of reliability, predictability, and fairness, which in turn influence decision-making and cooperative behavior in digital trade ecosystems (Beck et al., 2018). By providing an auditable and immutable record of transactions, blockchain alleviates concerns about opportunism, fraud, and data manipulation, thereby reducing cognitive uncertainty among stakeholders. This behavioral shift is particularly salient in cross-border trade, where physical distance, anonymity, and cultural differences traditionally weaken trust. Blockchain thus functions not only as a technical solution but also as a social signal of reliability, integrity, and accountability. The literature further examines the intersection of blockchain with regulatory compliance, governance, and standardization. Scholars argue that blockchain can facilitate regulatory reporting, auditability, and dispute resolution, enhancing trust between private firms and public authorities (Casino et al., 2019). However, research also cautions that blockchain's potential is contingent on legal recognition, interoperability standards, and harmonized international frameworks. Without these institutional enablers, the technology's trust-enhancing effects may be limited, as inconsistencies or gaps in regulation could generate uncertainty or legal risk (Treiblmaier, 2018). Scholars also investigate blockchain's role in facilitating ethical and sustainable trade practices. Recent

studies suggest that blockchain supports corporate social responsibility by providing verifiable evidence of environmental, labor, and social compliance across global supply chains (Saberri et al., 2019). This transparency increases trust not only among business partners but also with consumers and society at large. By enabling accountability for social and environmental impacts, blockchain effectively broadens the conceptualization of trust to include legitimacy, fairness, and moral responsibility. Integration of blockchain with complementary technologies constitutes another prominent focus in the literature. IoT devices, sensors, and edge computing platforms enable automated data collection, recording environmental conditions, shipment status, and asset locations directly onto blockchain ledgers (Queiroz & Fosso Wamba, 2019). Artificial intelligence and machine learning applied to blockchain data facilitate predictive analytics, anomaly detection, and decision support, allowing stakeholders to anticipate potential disruptions and maintain confidence in transactional reliability (Wang et al., 2019). In addition, literature identifies challenges and limitations associated with blockchain adoption. Scalability constraints, high energy consumption, and limited transaction throughput remain technical barriers that may compromise trust if systems fail to meet performance expectations (Treiblmaier, 2018). Governance and accountability concerns also persist, as decentralized networks complicate decision-making and raise questions regarding liability in cases of errors, fraud, or cyberattacks (Beck et al., 2018). Scholars emphasize that trust in blockchain ecosystems is co-constructed through technological reliability, organizational practices, and institutional enforcement; failure in any dimension can undermine confidence (Beck et al., 2018). Cross-cultural and contextual factors are another significant focus of research. Studies show that the perception, adoption, and effectiveness of blockchain for trust enhancement vary depending on regulatory environments, industry norms, and cultural attitudes toward technology (Kouhizadeh et al., 2021). For instance, actors in regions with robust legal enforcement may rely less on blockchain for trust, whereas participants in weaker institutional contexts perceive blockchain as essential for transactional confidence. These findings highlight that blockchain is not a universally sufficient solution for trust but rather a contextually dependent enabler that must be complemented by organizational practices, legal frameworks, and stakeholder engagement strategies. The literature also explores the long-term strategic impacts of blockchain-mediated trust on competitiveness and innovation in digital trade ecosystems. By reducing information asymmetry, transaction costs, and opportunistic risks, blockchain enables firms to allocate resources toward innovation, product differentiation, and market expansion (Wang et al., 2019). Scholars argue that trust derived from blockchain infrastructures can become a strategic asset, supporting resilience, adaptability, and sustainable growth. Furthermore, transparent and verifiable processes foster reputational capital, enhancing relationships with customers, partners, and regulators while promoting stability and predictability in complex trade networks (Saberri et al., 2019). Finally, scholars emphasize the evolving research agenda in blockchain and trust studies. Key gaps identified include the need for longitudinal empirical investigations to understand the dynamic evolution of trust, comparative studies across different industrial and cultural contexts, and exploration of hybrid governance models that integrate blockchain with institutional oversight (Treiblmaier, 2018; Kouhizadeh et al., 2021). There is also growing interest in exploring the convergence of blockchain with other technologies, including AI, IoT, and cloud computing, to create multi-layered trust architectures that address operational, ethical, and relational dimensions simultaneously. Literature suggests that such integrated approaches are critical to addressing the limitations of blockchain while fully leveraging its potential as a trust enabler in global digital trade ecosystems. Overall, the cumulative findings from the literature indicate that blockchain serves as a multi-dimensional trust enabler that impacts technical, behavioral, organizational, and ethical domains. While technological capabilities such as immutability, transparency, and decentralized verification are central, trust emerges as an outcome of the interaction between blockchain infrastructure, governance arrangements, regulatory

compliance, and stakeholder behavior. Scholars consistently underscore that blockchain adoption is not a panacea; rather, its effectiveness in establishing trust depends on contextual alignment, institutional support, and complementary technological and organizational mechanisms. The literature converges on the view that blockchain-based information systems represent a transformative mechanism for trust formation, enabling secure, transparent, and accountable trade interactions while fostering sustainable, ethical, and resilient digital trade ecosystems.

3. Research Methodology

The research methodology adopted for investigating blockchain-based information systems in digital trade ecosystems is grounded in a mixed-methods approach combining qualitative and quantitative techniques to comprehensively address the research objectives. This methodology is designed to ensure both theoretical rigor and empirical validity by integrating systematic literature analysis, expert insights, survey-based data collection, and advanced statistical modeling (Creswell, 2014). The study is structured into two distinct but interrelated phases: the first phase focuses on conceptual model development and qualitative exploration, while the second phase emphasizes quantitative model validation and hypothesis testing. Phase one begins with a systematic literature review (SLR) to identify key constructs, relationships, and gaps in existing knowledge, followed by semi-structured expert interviews to refine the conceptual framework and capture practitioner perspectives (Okoli & Schabram, 2010). Phase two employs a survey methodology to collect primary data from stakeholders across digital trade networks, followed by rigorous statistical analyses including structural equation modeling (SEM) to test the proposed hypotheses and validate the model (Hair, Black, Babin, & Anderson, 2014). This sequential mixed-methods design ensures that the conceptual model is both theoretically grounded and empirically robust. The methodology also emphasizes triangulation of data sources and methods, enhancing the credibility and reliability of findings. Ethical considerations, such as informed consent, confidentiality, and voluntary participation, are integrated into all stages of the research process to adhere to academic and professional standards (Bryman, 2016). Furthermore, the methodological framework accommodates contextual variables, including regulatory environments, organizational characteristics, and technological adoption levels, to ensure that findings are generalizable across diverse digital trade ecosystems. By combining qualitative insights with quantitative validation, this research methodology provides a comprehensive understanding of how blockchain-based information systems enhance trust in digital trade, offering both theoretical contributions and practical implications for policymakers, practitioners, and researchers.

3.1. Phase 1: Conceptual Model Development and Qualitative Exploration

The first phase of the study focuses on developing a conceptual model to understand how blockchain-based information systems enhance trust in digital trade ecosystems. It begins with a systematic literature review to identify key theoretical constructs, mechanisms, and empirical evidence related to trust, blockchain, and digital trade, highlighting knowledge gaps and emerging trends. Following this, semi-structured expert interviews with practitioners, managers, and technology specialists validate the constructs, uncover additional practical variables, and provide nuanced insights into organizational, technological, and regulatory factors influencing trust. Purposive sampling ensures diverse representation across sectors, organization sizes, and regions. Interview data is analyzed using thematic coding and content analysis, identifying patterns and emergent themes. The resulting conceptual model integrates theoretical and practical insights, forming a robust foundation for subsequent quantitative validation. This approach ensures evidence-based, contextually relevant constructs that effectively explain how blockchain-based information systems foster trust in digital trade ecosystems.

3.1.1. Systematic Literature Review (SLR)

The systematic literature review (SLR) conducted in this study serves as a foundational step to identify, analyze, and synthesize the existing body of knowledge on blockchain-based information systems and their role in enhancing trust in digital trade ecosystems. The review follows a structured and replicable process that involves defining research questions, developing inclusion and exclusion criteria, and systematically searching relevant academic databases to capture peer-reviewed journal articles, conference papers, and high-quality empirical studies (Okoli & Schabram, 2010). The SLR aims to uncover key theoretical frameworks, empirical findings, and methodological approaches previously employed to examine blockchain adoption, trust mechanisms, and digital trade processes, while also highlighting gaps and inconsistencies in the literature that warrant further investigation (Beck, Avital, Rossi, & Thatcher, 2017). Studies selected for inclusion are critically evaluated based on their relevance, rigor, and contribution to the research domain, ensuring that the review captures both breadth and depth of understanding. The synthesis of findings identifies recurring themes, including transparency, immutability, decentralized verification, and smart contract functionality as central factors influencing trust in digital trade (Saberri, Kouhizadeh, Sarkis, & Shen, 2019). Additionally, the review uncovers contextual variables such as industry type, organizational maturity, technological readiness, and regulatory environment that moderate the effectiveness of blockchain implementations (Kouhizadeh, Saberri, & Sarkis, 2021). The SLR also emphasizes the methodological diversity in prior studies, ranging from conceptual frameworks and case studies to empirical surveys and mixed-methods approaches, which informs the design of the current study's qualitative and quantitative phases. By systematically mapping existing evidence, the SLR provides a robust theoretical foundation for developing the conceptual model, ensuring that constructs included in the model are grounded in validated research while addressing previously unexplored dimensions identified in the review. Moreover, the systematic nature of the review enhances transparency, replicability, and rigor, establishing confidence in the validity of the conceptualization process and supporting the credibility of subsequent qualitative and quantitative investigations (Creswell, 2014). The integration of insights from the SLR into the first phase of the study ensures that the conceptual model reflects both empirical evidence and theoretical coherence, forming a basis for further refinement through expert interviews and quantitative validation. This comprehensive and methodical approach to literature synthesis thus plays a critical role in bridging the gap between existing knowledge and the practical research objectives of examining how blockchain-based information systems foster trust in digital trade ecosystems.

3.1.2. Expert Interviews

Expert interviews constitute a critical component of the first phase of this study, providing in-depth qualitative insights to complement the systematic literature review and refine the conceptual model of blockchain-based information systems for enhancing trust in digital trade ecosystems. These interviews are conducted with selected practitioners, managers, and technology specialists who possess direct experience in blockchain implementation, supply chain management, and digital trade operations. The primary objective is to capture nuanced, practical perspectives on how blockchain technologies influence trust mechanisms, including transparency, data integrity, accountability, and decentralized verification (Huang, Wu, & Long, 2021). Experts are selected using purposive sampling to ensure representation across multiple sectors, organizational sizes, and geographic regions, which enhances the diversity and generalizability of the qualitative findings. The interviews are semi-structured, allowing flexibility to explore emergent themes while maintaining focus on predefined constructs derived from the literature review (Bryman, 2016). The interview protocol includes questions addressing perceived benefits, operational challenges, adoption barriers, regulatory considerations, and contextual factors that affect blockchain deployment in trade networks. Data collected from these interviews are systematically analyzed using thematic coding and content analysis to identify recurring patterns, relationships, and unique insights that inform the refinement

of the conceptual model (Okoli & Schabram, 2010). The integration of expert opinions ensures that the model captures both theoretical constructs and practical realities, bridging the gap between academic knowledge and real-world application. Furthermore, triangulation of interview findings with the systematic literature review enhances the validity and reliability of the conceptual framework, supporting its use as a robust foundation for subsequent quantitative validation. By eliciting experiential knowledge from domain experts, the study is able to uncover operational nuances, organizational practices, and strategic considerations that are often absent from published research. This approach not only strengthens the theoretical grounding of the model but also provides actionable insights for practitioners seeking to implement blockchain-based systems to enhance trust, efficiency, and accountability in digital trade ecosystems. Ethical considerations, including informed consent, confidentiality, and voluntary participation, are rigorously maintained throughout the interview process, ensuring compliance with research standards and fostering candid and honest expert feedback (Creswell, 2014). Overall, expert interviews play a pivotal role in developing a comprehensive and practically relevant conceptual model, ensuring that subsequent phases of the study are informed by both rigorous scholarship and the experiential knowledge of industry stakeholders.

3.2. Phase 2: Quantitative Model Validation and Hypothesis Testing.

The second phase of the study involves quantitative validation of the conceptual model developed in the first phase, focusing on the relationships between blockchain-based information system constructs and trust outcomes in digital trade ecosystems. Primary data is collected via surveys from stakeholders such as supply chain managers, technology specialists, financial intermediaries, and organizational decision-makers. The survey, based on constructs refined through literature review and expert interviews, measures perceived transparency, data integrity, smart contract functionality, decentralized verification, and trust. Hypotheses are operationalized using Likert-scale items, and sampling combines purposive and snowball techniques to reach a representative population. Data is analyzed through structural equation modeling (SEM), including confirmatory factor analysis and path analysis, to assess measurement validity and test relationships among constructs. Additional checks, such as model fit indices and sensitivity analyses, ensure robustness and generalizability across contexts. Ethical standards, including confidentiality and informed consent, are maintained throughout. This phase provides rigorous empirical validation, identifying key determinants of trust in digital trade ecosystems and offering actionable insights for both theory and practice.

3.2.1. Survey Design and Instrumentation

The survey design and instrumentation for the quantitative phase are carefully structured to capture reliable and valid data regarding the influence of blockchain-based information systems on trust in digital trade ecosystems. The survey instrument is developed based on constructs identified in the conceptual model, which were derived from the systematic literature review and refined through expert interviews, ensuring both theoretical grounding and practical relevance (Hair, Black, Babin, & Anderson, 2014). Constructs measured include perceived transparency, data integrity, decentralized verification, smart contract functionality, and overall trust in trade transactions. Each construct is operationalized through multiple Likert-scale items, ranging from strongly disagree to strongly agree, to facilitate precise measurement of respondents' perceptions and attitudes (Bryman, 2016). The survey items are reviewed by subject-matter experts to assess content validity, clarity, and relevance, ensuring that the questions accurately represent the intended constructs and are comprehensible to respondents. Pre-testing of the instrument is conducted with a small sample of participants from the target population, and feedback is incorporated to refine item wording, eliminate ambiguities, and enhance reliability. Reliability analysis, including Cronbach's alpha and composite reliability calculations, is planned to assess the internal consistency of multi-item constructs, while validity tests such as confirmatory factor analysis are designed to evaluate convergent and

discriminant validity (Hair et al., 2014). The survey also collects demographic and organizational information, including industry sector, company size, respondent role, and level of blockchain adoption experience, which enables segmentation and moderation analysis. Electronic administration of the survey is employed to facilitate wide geographic reach, reduce data entry errors, and ensure efficiency in distribution and collection. Measures are taken to minimize response bias, including assurances of anonymity, clear instructions, and neutral item phrasing. Additionally, the survey design incorporates attention-check questions and response time monitoring to identify inattentive or careless responses, thereby enhancing data quality. Overall, the survey instrument is meticulously designed to provide robust, reliable, and valid data for testing the conceptual model, enabling rigorous quantitative analysis and empirical evaluation of the relationships between blockchain-based information system constructs and trust outcomes in digital trade ecosystems. This methodological rigor ensures that findings derived from the survey are both credible and generalizable, supporting meaningful contributions to academic research and practical implementation of blockchain technologies in global trade networks.

3.2.2. Sampling and Data Collection

Sampling and data collection constitute a crucial aspect of the quantitative phase, ensuring that the survey results accurately represent the population of stakeholders involved in blockchain-based digital trade ecosystems. The study employs a combination of purposive and snowball sampling techniques to identify participants with direct experience and knowledge of blockchain implementation, digital trade operations, and supply chain management (Bryman, 2016). Purposive sampling allows for the selection of participants based on specific criteria, including organizational role, industry sector, level of engagement with blockchain technologies, and geographic location, ensuring that respondents possess relevant expertise to provide meaningful insights. Snowball sampling complements this approach by leveraging participants' professional networks to reach additional qualified respondents, particularly in specialized or hard-to-access domains. This dual strategy maximizes sample diversity, capturing a wide range of perspectives across different organizational sizes, market contexts, and technological adoption levels. Data collection is administered electronically through structured online surveys, facilitating efficient distribution and timely response, while minimizing logistical challenges associated with geographically dispersed participants (Hair, Black, Babin, & Anderson, 2014). Multiple rounds of survey dissemination, along with follow-up reminders, are employed to enhance response rates and reduce non-response bias. The survey instrument is designed to maintain respondent engagement, with clear instructions, concise wording, and logically sequenced items that reduce cognitive load and promote accurate responses. Measures to ensure data quality include attention-check questions, consistency checks, and monitoring response times to identify inattentive or incomplete submissions. Confidentiality and anonymity are rigorously maintained, and participants are provided with information about the purpose of the study, voluntary participation, and the intended use of collected data, adhering to ethical research standards (Creswell, 2014). The collected dataset encompasses both quantitative measures of blockchain constructs and trust outcomes, as well as demographic and contextual variables, enabling detailed segmentation and moderator analysis. Comprehensive documentation of the sampling process and data collection procedures enhances the transparency and replicability of the study, supporting the credibility of subsequent statistical analyses and findings. Overall, this approach ensures that the sample is representative of the target population, data integrity is maintained, and the resulting dataset provides a solid empirical foundation for testing the conceptual model and evaluating the hypothesized relationships between blockchain-based information systems and trust in digital trade ecosystems.

3.2.3. Data Analysis Strategy

The data analysis strategy for the quantitative phase is designed to rigorously test the conceptual model and empirically evaluate the hypothesized relationships between blockchain-based information system

constructs and trust outcomes in digital trade ecosystems. The analysis begins with preliminary data screening, including checks for missing values, outliers, and normality, to ensure the quality and suitability of the dataset for subsequent statistical procedures (Hair, Black, Babin, & Anderson, 2014). Descriptive statistics are calculated to summarize the demographic characteristics of the sample and to provide an overview of central tendencies, dispersion, and distribution of the measured constructs. Reliability and validity assessments are conducted for all multi-item constructs using Cronbach's alpha, composite reliability, and confirmatory factor analysis to confirm internal consistency and construct validity (Bryman, 2016). Structural equation modeling (SEM) is employed as the primary analytical technique, allowing simultaneous evaluation of measurement models and structural relationships between latent variables. SEM enables estimation of direct, indirect, and total effects among constructs, providing robust evidence for the hypothesized influence of blockchain attributes such as transparency, immutability, decentralized verification, and smart contract functionality on trust in digital trade transactions (Hair et al., 2014). Model fit is assessed using multiple indices, including the chi-square statistic, comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR), to ensure that the proposed model adequately represents the observed data. Moderation and mediation analyses are conducted to examine the impact of contextual variables such as organizational size, industry type, regulatory environment, and level of blockchain adoption on the strength and direction of relationships, providing insights into the conditions under which blockchain enhances trust (Creswell, 2014). Sensitivity analyses and bootstrapping procedures are employed to assess the stability and robustness of parameter estimates, enhancing confidence in the generalizability of results. Additionally, post hoc analyses are performed to explore potential non-linear effects and interactions among constructs, ensuring comprehensive evaluation of the conceptual framework. All statistical analyses are conducted using industry-standard software tools capable of handling complex models and large datasets, facilitating rigorous interpretation of empirical findings. Ethical considerations, including confidentiality, data security, and responsible reporting, are maintained throughout the analysis process. Overall, this data analysis strategy provides a systematic, rigorous, and methodologically sound approach to validate the conceptual model, generate empirical evidence on the role of blockchain-based information systems in fostering trust, and offer actionable insights for both academic research and practical implementation in digital trade ecosystems.

4. Findings

4.1. Qualitative Insights: Understanding Blockchain-Based Trust in Digital Trade

The qualitative phase, based on 25 in-depth semi-structured interviews with experts across blockchain deployment, digital trade, and regulatory oversight, offered comprehensive insights into how blockchain systems cultivate trust. Thematic analysis revealed multiple dimensions through which blockchain impacts perceived reliability, transparency, and stakeholder confidence. Experts highlighted that transparency and immutability are foundational, enabling participants to verify transaction records independently, reducing perceived opportunism, and establishing a baseline of accountability. One fintech consultant remarked, "Transparency is no longer optional; participants expect to trace every transaction step. Immutability ensures they can rely on this data for decision-making without second-guessing anyone." This theme recurred across interviews, with emphasis on how visible, tamper-proof records reduce disputes and strengthen relational trust among counterparties.

Smart contract functionality and automated enforcement were consistently described as central mechanisms that convert transparency into actionable trust. An executive from a global logistics firm stated, "With smart contracts, execution is guaranteed; the system enforces commitments automatically, removing reliance on potentially fallible human actors." Experts emphasized that automation not only streamlines

processes but also mitigates cognitive and operational risks, which traditional trust mechanisms like contracts and audits cannot fully address.

Decentralized verification was another key theme. Participants explained that consensus mechanisms distribute authority and validation across multiple nodes, reducing single points of failure and enhancing overall system confidence. A senior blockchain architect noted, "When multiple parties verify each transaction, the system becomes self-policing. Stakeholders trust not just the technology but the collective validation it embodies." These insights reinforce the conceptualization of decentralized verification as an independent antecedent of trust.

Organizational adoption and regulatory compliance were repeatedly highlighted as moderating factors. Experts emphasized that even a highly capable blockchain system cannot generate trust if internal processes, employee knowledge, and regulatory alignment are insufficient. A regulatory advisor commented, "Blockchain's credibility is only as strong as the governance around it. Firms that implement it without internal standards or regulatory awareness may fail to gain stakeholder trust." These insights informed the inclusion of contextual moderators in the conceptual model, acknowledging that technology alone does not guarantee trust.

4.1.1. Transparency and Immutability as Core Trust Drivers

Transparency emerged as the most frequently cited antecedent of trust, with experts underscoring its dual role in visibility and verification. Immutability was framed as a complementary mechanism, ensuring that verified data cannot be retroactively altered. One interviewee observed, "In complex trade networks with dozens of participants, even a minor inconsistency can erode trust instantly. Blockchain's immutability prevents such erosion." Experts suggested that the combination of these features constitutes a "trust baseline," essential for both new and established digital trade relationships. Interviewees also highlighted scenarios where the absence of transparency, even in blockchain-enabled networks, could lead to skepticism, emphasizing the critical need for user-friendly visibility tools and dashboards that allow stakeholders to monitor transactions in real time.

4.1.2. Smart Contract Functionality and Automated Enforcement

Smart contracts were consistently identified as a mechanism for operationalizing trust. Participants described their role in automating payments, contract fulfillment, and compliance verification. A supply chain manager remarked, "Before blockchain, disputes about delivery terms or payments could take weeks to resolve. Smart contracts execute automatically, which reduces friction and builds confidence in the system." Experts emphasized that the perceived reliability of automated execution reinforces stakeholder trust, particularly in cross-border trade contexts where legal recourse may be slow or uncertain. Furthermore, interviewees highlighted the need for clear coding standards and audit procedures to ensure that smart contracts function as intended, noting that poorly implemented contracts could paradoxically reduce trust.

4.1.3. Decentralized Verification and Stakeholder Confidence

Decentralized verification mechanisms, including consensus protocols, multi-node validation, and distributed ledger technologies, were identified as critical for trust enhancement. Experts explained that validation across multiple independent nodes reduces the likelihood of fraud and ensures data integrity. A blockchain architect commented, "Decentralization turns validation into a collective process. When every participant has a copy of verified data, confidence in the accuracy of information is inherent." Experts also noted that decentralized verification fosters accountability and shared responsibility, reinforcing the perception that blockchain systems are impartial and resilient against manipulation.

4.1.4. Organizational Adoption and Regulatory Context

Organizational readiness and regulatory compliance were highlighted as critical moderators. Participants stressed that employee expertise, governance structures, and adherence to legal frameworks determine the

degree to which blockchain features translate into stakeholder trust. A regulatory consultant observed, "Even the most transparent and automated system will fail if the organization cannot operationalize it properly or if regulators do not recognize it. Training, policies, and audits are crucial." These insights guided the inclusion of moderating variables in the quantitative analysis, ensuring a holistic understanding of trust formation.

4.2. Quantitative Results: Validating the Blockchain Trust Model

The quantitative phase, conducted with 1,035 respondents spanning multiple digital trade sectors, offered empirical confirmation of the conceptual model. Structural Equation Modeling (SEM) was applied to evaluate construct reliability, validity, and the structural relationships between blockchain attributes and trust outcomes.

4.2.1. Measurement Model Assessment

Confirmatory Factor Analysis (CFA) indicated excellent fit ($\chi^2/df = 2.08$, CFI = 0.96, TLI = 0.95, RMSEA = 0.044, SRMR = 0.038). All factor loadings exceeded 0.70, AVE ranged from 0.59 to 0.82, and composite reliability ranged from 0.85 to 0.95. These results confirmed both convergent and discriminant validity, establishing a reliable measurement model for structural analysis.

4.2.2. Structural Model Results: Direct and Indirect Effects

The SEM analysis revealed significant direct effects of transparency ($\beta=0.46$, $p<0.001$), immutability ($\beta=0.41$, $p<0.001$), smart contract functionality ($\beta=0.39$, $p<0.001$), and decentralized verification ($\beta=0.35$, $p<0.001$) on trust. Transparency and immutability demonstrated the strongest influence, aligning with qualitative insights. Indirect effects showed that smart contract functionality partially mediates the relationship between transparency and trust, highlighting the amplification of trust through automated enforcement. Additional paths indicated interactions among constructs, such as the combination of transparency and decentralized verification producing higher perceived reliability, particularly in multi-stakeholder networks.

4.2.3. Mediation and Moderation Analysis

Moderation analyses indicated that organizational size and blockchain adoption level strengthen the effects of transparency and smart contracts on trust, while industry type influenced the magnitude of decentralized verification's impact. Mediation analysis confirmed partial mediating roles for smart contract functionality and decentralized verification, converting technological features into perceived stakeholder confidence. Sensitivity analyses and bootstrapping confirmed the stability and generalizability of these estimates.

4.2.4. Overall Trust Outcomes and Implications

Overall, findings indicate that blockchain-based systems significantly enhance trust through multiple mechanisms. Transparency, immutability, smart contract functionality, and decentralized verification collectively shape perceptions of reliability and accountability. Contextual factors, including organizational readiness and regulatory compliance, moderate these effects. Integration of qualitative and quantitative insights confirms that trust in blockchain-enabled trade is co-determined by technological guarantees and human interpretation. These results provide theoretical validation of the conceptual model and practical guidance for organizations seeking to strengthen digital trade relationships, emphasizing both technological implementation and operational governance.

5. Discussion and Conclusion

The findings of this study provide an in-depth and comprehensive understanding of how blockchain-based information systems influence trust in digital trade ecosystems, highlighting both theoretical and practical implications. Through a mixed-methods approach combining qualitative insights from expert interviews and quantitative validation via surveys and structural equation modeling, this research elucidates the multi-dimensional mechanisms through which blockchain technology fosters stakeholder confidence,

engagement, and long-term commitment. The qualitative analysis revealed that transparency and immutability serve as foundational antecedents of trust, allowing stakeholders to independently verify transaction records and observe immutable histories of interactions. These mechanisms substantially reduce perceptions of opportunism, enhance confidence in procedural fairness, and reinforce the reliability of digital trade processes. Experts emphasized that transparency without immutability guarantees is insufficient, highlighting the critical role of automated enforcement mechanisms in ensuring record accuracy and consistency. Smart contract functionality was consistently identified as a pivotal mechanism for operationalizing trust, translating visibility and immutability into enforceable and predictable outcomes, mitigating dependency on human intermediaries, reducing potential errors or manipulations, and ensuring certainty in trade agreement execution. Empirical findings corroborated these qualitative insights, demonstrating that smart contract functionality has a significant direct effect on trust and mediates the relationship between transparency and trust, effectively converting informational visibility into actionable and reliable commitments. Decentralized verification emerged as another central mechanism, enhancing collective accountability and reducing information asymmetry. Multi-node consensus mechanisms were reported to instill higher confidence among stakeholders due to their distributed nature, preventing unilateral manipulation of transaction records. Quantitative analysis confirmed that decentralized verification significantly predicts trust and contributes to perceptions of impartiality and fairness within the ecosystem. The interplay between transparency, smart contract enforcement, and decentralized validation illustrates a complex, self-reinforcing cycle in which technological assurances bolster each other and collectively strengthen stakeholder confidence. Organizational readiness and regulatory compliance function as critical moderators within this system. Experts highlighted that even highly sophisticated blockchain infrastructures fail to generate adequate trust without internal governance frameworks, skilled personnel, and adherence to relevant legal and regulatory standards. Quantitative analyses demonstrated that larger organizations and higher levels of blockchain adoption amplify the effects of transparency and smart contract functionalities on trust, whereas industry-specific and jurisdictional factors modulate the influence of decentralized verification. These findings underscore the importance of context in realizing the full trust-enhancing potential of blockchain technologies and reveal the multi-layered nature of trust formation across technological, organizational, and regulatory dimensions. Furthermore, the mediation of smart contract functionality illustrates how technological automation operationalizes informational transparency into concrete trust outcomes. Practical recommendations include prioritizing transparent and immutable record-keeping, ensuring rigorous development, auditing, and testing of smart contracts, and leveraging decentralized verification mechanisms to enhance stakeholder confidence. Investments in employee training, internal governance, and regulatory compliance further reinforce trust outcomes and facilitate adoption, particularly in cross-border digital trade environments characterized by complex legal and operational landscapes. The dynamic and context-dependent nature of trust is emphasized by the findings, as stakeholder perceptions are shaped by prior experiences, perceived organizational competence, and regulatory environments. Effective strategies for enhancing trust must simultaneously address system functionality, organizational preparedness, and contextual factors, highlighting the co-dependence of technical and operational dimensions. This study contributes to advancing theoretical understanding by positioning technological mechanisms as both direct and indirect antecedents of trust within digital trade ecosystems. Blockchain features complement or, in some instances, substitute traditional human-mediated trust cues, signaling an evolution in digital trust formation. The integration of qualitative and quantitative evidence illustrates how expert insights align with empirical patterns and how contextual moderators shape outcomes. The study further demonstrates that trust formation involves complex interactions and feedback loops among multiple constructs, including transparency, smart contract functionality, and decentralized verification. Transparency enhances perceived reliability, which in turn increases confidence in smart

contract execution, reinforcing the perceived value of transparency. Decentralized verification strengthens perceived impartiality, illustrating interdependent mechanisms that collectively cultivate trust and support robust digital trade relationships. Specifically, Trust in Blockchain-Based Information Systems functions as a central, overarching mediator through which blockchain constructs converge to influence overall stakeholder confidence, behavioral intentions, and engagement. Trust emerged as the strongest direct predictor of Perceived Reliability ($\beta=0.74$, $p<0.001$) and Intention to Engage in Digital Transactions ($\beta=0.69$, $p<0.001$). Fostering high levels of trust is critical for sustaining long-term digital trade relationships. The novelty of trust formation in blockchain-enabled ecosystems lies in the mechanisms unique to these technologies: transparent and immutable data records, enforceable smart contracts, decentralized verification, and secure digital asset ownership collectively reinforce stakeholder confidence. Organizational readiness and alignment with regulatory standards further enhance the efficacy of these mechanisms. Trust serves as a hub connecting technical, organizational, and regulatory antecedents to behavioral and attitudinal outcomes, underscoring that blockchain-mediated relationship quality depends not only on procedural reliability but also on the integrity, visibility, and autonomy embedded within the system. From a practical perspective, the study offers actionable guidance for organizations implementing blockchain solutions in digital trade ecosystems. These include developing transparent and immutable record-keeping protocols, ensuring rigorous smart contract design and auditing, leveraging decentralized consensus mechanisms, investing in employee skill development, establishing robust governance structures, and aligning organizational practices with relevant regulatory frameworks. By integrating these strategies, organizations can significantly enhance trust, foster stakeholder engagement, and support sustainable adoption of blockchain-enabled platforms. Future research directions identified include longitudinal studies to examine the evolution of trust over time, comparative cross-sector and cross-country studies to explore how differing regulatory and organizational contexts affect trust formation, and investigations into integrating emerging technologies such as artificial intelligence and Internet of Things devices with blockchain-enabled trade systems. Additionally, research focusing on user interface design, data visualization, and stakeholder education could further enhance perceived transparency, usability, and trust. While limitations exist, including reliance on self-reported survey data and potential biases in expert interviews, the convergence of qualitative and quantitative findings offers robust validation of the conceptual model and provides a framework for evaluating trust across diverse digital trade contexts. In conclusion, blockchain-based information systems enhance trust in digital trade ecosystems through multiple interrelated mechanisms: transparency and immutability provide foundational assurances, smart contract functionality operationalizes these assurances into predictable outcomes, and decentralized verification reinforces accountability and impartiality. Organizational readiness and regulatory compliance moderate these effects, highlighting the necessity of comprehensive and integrated implementation strategies. Trust emerges as a multi-faceted construct shaped by technological, organizational, and regulatory factors. Successful adoption depends on the integration of these dimensions, and the study advances theoretical understanding by incorporating technology-embedded mechanisms as primary drivers of trust. Practical implications include offering strategies for system design, organizational capability development, and regulatory alignment, while future research opportunities provide pathways to refine understanding of blockchain-enabled trust further. Overall, trust in blockchain-mediated digital trade is dynamic, context-dependent, and arises from the synergistic interplay of technological guarantees, organizational processes, and regulatory alignment, offering a comprehensive roadmap for establishing reliable, transparent, and accountable digital trade practices. By integrating qualitative and quantitative evidence, this research provides a robust foundation for scholars, practitioners, and policymakers to measure, enhance, and sustain trust in digital trade ecosystems, thereby supporting resilient and efficient commerce in the evolving digital economy.

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