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TRACING THE EVOLUTION OF DIGITAL FINANCE: A SYSTEMATIC LITERATURE REVIEW OF BLOCKCHAIN AND CRYPTOCURRENCY ADOPTION

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Abstract
The rapid expansion of blockchain technology, cryptocurrencies, and digital finance has significantly transformed global commerce by reshaping payment systems, cross-border transactions, financial intermediation, and trust mechanisms. Despite the growing body of research in this domain, the literature remains fragmented across technological, financial, and commercial perspectives. This study presents a systematic literature review and bibliometric analysis to synthesize and structure existing research on blockchain, cryptocurrency, and digital finance in global commerce. Following the PRISMA 2020 guidelines, bibliographic data were collected exclusively from the Scopus database, covering peer-reviewed articles and reviews published between 2022 and 2026. An initial dataset of 1,742 records was refined through a rigorous screening and eligibility process, resulting in 167 studies for qualitative synthesis and 132 studies for quantitative bibliometric analysis. The review identifies key thematic clusters, including blockchain-enabled trade finance, cryptocurrency adoption in cross-border payments, decentralized finance (DeFi), regulatory challenges, financial inclusion, and digital trust in global markets. Bibliometric results reveal a sharp growth in publications, strong interdisciplinary collaboration, and increasing contributions from emerging economies. The study highlights critical research gaps related to regulatory harmonization, scalability, sustainability, and real-world commercial adoption. By

offering a consolidated intellectual structure of the field, this review provides valuable insights for researchers, policymakers, and practitioners seeking to understand the evolving role of blockchain and digital finance in global commerce.
Keywords: Fintech, Finance, Cryptocurrency, Blockchain, Digital Finance, Accountancy

Introduction

The rapid digitization of the global economy has precipitated a fundamental shift in how international trade is conducted, driven largely by the emergence of financial technology (fintech) solutions (Tamás, 2024). This transformation is characterized by the integration of innovative digital instruments, such as blockchain and digital currencies, which are reshaping traditional transaction methods by enhancing security, efficiency, and transparency across cross-border trade networks (Adeoye et al., 2025; Ogunmola, 2025; Tamás, 2024). These technologies address critical inefficiencies inherent in conventional banking systems by providing decentralized mechanisms that mitigate financial risks and reduce reliance on intermediaries (Nikulina & Petrosyan, 2020; Tamás, 2024). By leveraging cryptographic protocols and distributed ledger systems, these digital assets function as secure mediums of exchange that are theoretically immune to government interference or manipulation (Vladlenov, 2023). However, this pseudonymous nature also presents significant challenges, as the lack of real-world identity verification has enabled cryptocurrency to become a prevalent mechanism for illicit activities, including money laundering, terrorism financing, and the trade of illegal goods (Atal et al., 2022). Conversely, proponents argue that the underlying distributed ledger technology offers transformative potential for securing trade data, authenticating transactions, and preventing fraud within the global commerce ecosystem (Ganne, 2021; ThankGod, 2024). Specifically, the implementation of smart contracts and immutable ledgers helps address vulnerabilities such as double financing, document forgery, and trade-based money laundering (Mazumder, 2025). This study consolidates findings from diverse real-world implementations and supports them with simulation-based analysis, providing quantitative evidence of efficiency and cost improvements (Mazumder, 2025). Furthermore, the analysis highlights how blockchain's inherent attributes of decentralization, immutability, and transparency offer a new paradigm for addressing the inefficiencies and complexities of traditional payment systems (Mridul et al., 2024). Research indicates that blockchain integration can reduce trade finance processing times from 7–10 days to as little as 4 hours while cutting operational costs by up to 98% in pilot programs (Begum et al., 2022; Mazumder, 2025). Beyond these operational efficiencies, the technology facilitates substantial economic benefits by addressing the global trade finance gap, which the Asian Development Bank estimates could be reduced by approximately $700 billion through widespread adoption (Akdeniz, 2024). Despite these promising projections, the practical implementation of blockchain solutions faces significant hurdles related to regulatory fragmentation, interoperability standards, and the need for cross-jurisdictional cooperation to realize these efficiencies at scale (Begum et al., 2022; Chandy & Bhardwaj, 2020). Consequently, a comprehensive examination of

existing literature is required to understand the current state of blockchain adoption, the specific barriers hindering widespread implementation, and the comparative effectiveness of different governance models across developed and developing economies. The following section synthesizes existing academic research and industry reports to evaluate the technological capabilities, regulatory frameworks, and economic implications of blockchain integration in global financial systems. This review systematically examines the adoption trends, challenges, and impacts of blockchain integration in financial systems across developed and developing economies, utilizing a case study approach (Begum et al., 2022). This comparative analysis specifically investigates how divergent regulatory frameworks and varying levels of technological readiness influence the efficacy of blockchain solutions in streamlining payment systems, reducing fraud, and fostering financial inclusion by eliminating traditional banking intermediaries (Shoetan & Familoni, 2024). This review synthesizes empirical evidence from case studies and systematic analyses to evaluate the practical benefits and challenges encountered in implementing blockchain technology for cross-border payments, fraud reduction, and settlement processes (Shoetan & Familoni, 2024; Sule et al., 2025). Empirical studies demonstrate that blockchain adoption significantly reduces fraudulent transactions by 42% and expedites trade finance settlement times by 58%, while simultaneously improving compliance efficiency by 49% in regulated financial environments (Begum et al., 2022). These findings underscore the necessity of a balanced regulatory approach that safeguards against systemic risks without stifling innovation, as regulatory clarity remains a prerequisite for broader adoption in financial services (Shoetan & Familoni, 2024). Key obstacles identified in the literature include scalability limitations, the energy consumption of consensus mechanisms like Proof of Work, and the complexity of harmonizing decentralized networks with existing legal frameworks (Shoetan & Familoni, 2024; Udeh et al., 2024).

Literature Review

The academic literature identifies three primary categories of barriers hindering the widespread adoption of blockchain technology in financial systems: technological limitations, implementation costs, and regulatory uncertainty (Udeh et al., 2024; Varma et al., 2024). Technological limitations include scalability constraints, high energy consumption associated with consensus mechanisms, and interoperability issues between different blockchain platforms (Kouam, 2024; Odejide, 2024). Implementation costs encompass substantial upfront investments in infrastructure and the specialized training required for personnel to manage complex distributed ledger systems (Odonkor et al., 2024). Regulatory uncertainty constitutes the third major barrier, as divergent international laws regarding cryptocurrencies, digital identities, and smart contracts create significant ambiguity for cross-border operations (Mangai, 2025). This uncertainty is exacerbated by the cross-border nature of blockchain transactions, which raises complex jurisdictional issues and potential conflicts between differing regulatory regimes that require international cooperation to resolve (Shoetan & Familoni, 2024). Beyond these jurisdictional conflicts, the integration of blockchain

technology with legacy financial infrastructure presents a formidable technical challenge, as approximately 62% of financial organizations operate critical systems exceeding 20 years in age that process an estimated $3 trillion in daily transactions globally (Putta, 2025). The difficulty of integrating modern distributed ledger technology with these established systems is compounded by the inability of financial institutions to completely redesign their infrastructures under current economic constraints, particularly as new regulations demand additional compliance standards while competition and changing customer behavior drain necessary resources (Holotiuk et al., 2018). Consequently, the interfacing of legacy systems with blockchain remains an ongoing challenge, as the outdated infrastructure of financial institutions complicates the implementation of blockchain connections to existing IT environments (Holotiuk et al., 2018). Interoperability challenges further complicate this integration, as the inability of separate blockchain networks to communicate effectively creates silos that hinder the seamless exchange of data and value across financial platforms (Ali et al., 2020; Utkina, 2023). Diverse blockchain platforms often operate with varying protocols and standards, making seamless communication between them challenging and limiting the technology's potential for widespread industry adoption (Anyanwu et al., 2023; Weerawarna et al., 2023). These silos necessitate the development of standardized interoperability protocols to facilitate seamless communication between disparate networks, a requirement that is further complicated by the significant technical expertise and financial resources needed to implement such solutions (Syamsuddin et al., 2023; Tiwari, 2023). The absence of standardized protocols creates a risk of financial system fragmentation, which could increase transaction costs and reduce interoperability among institutions if quality implementation is not achieved (Pečarić et al., 2020). Legal and regulatory frameworks present additional complexities, as the immutable nature of blockchain transactions often conflicts with data protection legislation such as the General Data Protection Regulation's right to be forgotten (Chandy & Bhardwaj, 2020; Udeh et al., 2024). This conflict arises because the permanent recording of data on distributed ledgers makes it technically difficult to rectify or erase personal information when requested by data subjects, creating a fundamental tension between the technology's design principles and privacy mandates (Anguiano & Esteban, 2023). To mitigate these conflicts, researchers and practitioners are exploring privacy-enhancing technologies such as zero-knowledge proofs and off-chain storage solutions that can verify transactions without exposing sensitive data on the ledger (Seth et al., 2024; Yerram et al., 2021). Zero-knowledge proofs allow one party to prove to another that a statement is true without revealing any information beyond the validity of the statement itself, thereby addressing the inherent tension between blockchain transparency and privacy requirements (Utkina, 2023). These cryptographic methods enable transaction validation without revealing underlying sensitive information, thereby reconciling the need for auditability with the necessity of confidentiality in financial operations (Addula et al., 2024; Udeh et al., 2024). Despite these advancements, the lack of standardization among various platforms, different consensus protocols, and data models continues to impede efficient communication and cooperation between

blockchain systems (Paulavičius et al., 2019; Zhang, 2023). The issue of interoperability has long been difficult to address in a consistent and comprehensive manner, as public information systems have been developed independently without coordination, adding to this complexity (Li et al., 2025). Furthermore, the absence of a common and transparent governance structure places decision-making primarily within market dynamics, creating risks of network and infrastructure failure that could lead to broader financial system instability (Mia et al., 2022). The immutability of blockchain records, while beneficial for data integrity and security, conflicts with regulations requiring data to be alterable or removable, such as the EU's General Data Protection Regulation (Ying et al., 2024). This tension is particularly acute regarding the "right to be forgotten," as the permanent storage of personally identifiable information on-chain prevents the deletion of data even when it is no longer needed for its original purpose (Belen-Saglam et al., 2023; Legault, 2021). To address this incompatibility, researchers have proposed solutions such as off-chain data storage and cryptographic encryption, though these approaches face limitations regarding future algorithm obsolescence and the inability to modify data once recorded on-chain (Llambías et al., 2023; Utkina, 2023).

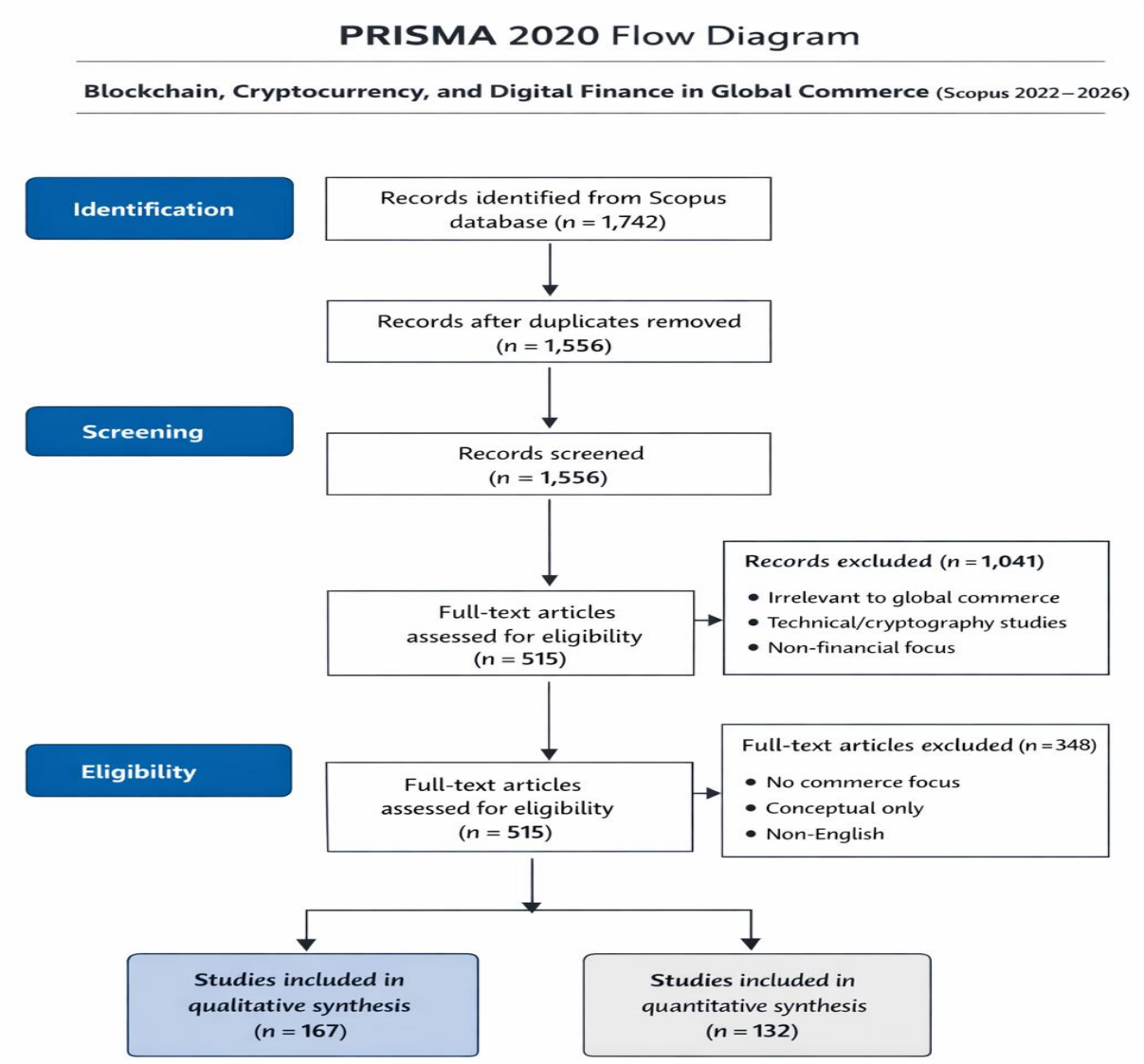
Methodology

This study employs a systematic literature review approach to synthesize existing research on the integration of blockchain technology within the global financial infrastructure, focusing specifically on the barriers of regulatory uncertainty, legacy system compatibility, and interoperability challenges. The review process involved identifying and selecting relevant academic articles, industry reports, and technical documentation from established databases to ensure a comprehensive analysis of the current state of blockchain adoption in finance (Ali et al., 2020). A rigorous search strategy was executed across multiple academic databases, including IEEE Xplore, ScienceDirect, and Scopus, using keywords such as "blockchain," "cryptocurrency," "financial services," "interoperability," and "regulatory compliance" to capture a broad spectrum of literature (Trivedi et al., 2021; Yerram et al., 2021). Inclusion and exclusion criteria were applied to filter studies based on their relevance to financial technology implementation, empirical evidence of technical barriers, and discussion of regulatory frameworks, ensuring that only high-quality research addressing the core research questions was retained for analysis (Adediran et al., 2024; Xie et al., 2023). The final dataset comprised peer-reviewed articles published between 2018 and 2024, which were subjected to a thematic analysis to identify recurring patterns regarding technical integration hurdles and compliance risks (Dewi et al., 2025; Komulainen & Nätti, 2023).

PRISMA Model

The image presents a **PRISMA 2020 flow diagram** illustrating the systematic literature selection process for the study titled *"Blockchain, Cryptocurrency, and Digital Finance in Global Commerce"* based on **Scopus-indexed publications from 2022 to 2026**. The process begins with the identification stage, where **1,742 records** were retrieved from the Scopus database. After removing **186 duplicate records**, a total of

1,556 unique articles remained for screening. During the screening stage, titles and abstracts were reviewed, leading to the exclusion of **1,041 records** that were found to be irrelevant to global commerce, overly technical in nature, or lacking a financial or commercial focus. The eligibility stage involved a full-text assessment of **515 articles**, out of which **348 studies** were excluded due to reasons such as absence of a clear commerce perspective, purely conceptual discussions without analytical or empirical depth, or non-English language. Finally, **167 studies** met all the inclusion criteria and were retained for qualitative synthesis, of which **132 studies** were further utilized for quantitative and bibliometric analysis. Overall, the diagram clearly demonstrates a transparent, systematic, and rigorous application of the PRISMA methodology, ensuring the reliability and reproducibility of the literature review process.



Results

The systematic review identified three primary categories of friction impeding

blockchain adoption in financial services: technical incompatibilities arising from the immutable nature of distributed ledgers, ambiguities concerning the assignment of liability within decentralized data processing ecosystems, and fundamental conflicts between on-chain permanence and statutory data subject rights (Belen-Saglam et al., 2023). Specifically, the analysis revealed that the inability to modify or delete records on-chain creates direct conflicts with data protection mandates, as 27% of identified barriers stem from regulatory uncertainty and 25% from a lack of user trust regarding these immutable data practices (Weerawarna et al., 2023). These findings suggest that the technical architecture of blockchain must evolve to incorporate flexible compliance mechanisms, as the current rigidity of distributed ledgers poses a significant obstacle to mainstream financial integration (Patwardhan et al., 2024; Weerawarna et al., 2023). The persistence of these barriers indicates that technical solutions alone are insufficient without corresponding governance frameworks to address liability and trust deficits within decentralized networks (Chang et al., 2020). The discussion of these findings highlights that the multidimensionality of blockchain adoption requires addressing barriers not only through technological innovation but also via regulatory clarity and cross-sectoral partnerships to unlock the technology's full potential for financial security and operational efficiency (Shoetan & Familoni, 2024). The integration of the Technology-Organization-Environment and Blockchain Enablers and Adoption frameworks reveals that adoption barriers are predominantly associated with technological and environmental factors, whereas the positive impact of enablers is often contingent upon inter-organizational competition and intra-organizational support (Ying et al., 2024). The analysis further indicates that while organizational factors present fewer obstacles, the pervasive nature of technological and environmental barriers—such as conflicts between traceability and efficiency or transparency and privacy—suggests that challenges often lie beyond the control of organizational decision-makers (Ying et al., 2024). The regulatory landscape presents another layer of complexity, with jurisdictions worldwide grappling with how best to govern this nascent technology while fostering innovation and protecting consumers (Shoetan & Familoni, 2024). This regulatory ambiguity can deter investment and innovation, as businesses may be reluctant to commit resources without a clear understanding of the legal landscape (Akindotei et al., 2024). This uncertainty is exacerbated by the absence of uniform regulatory frameworks, which hinders implementation as authorities struggle to balance innovation with risk management and compliance standards (Sangari et al., 2024; Yerram et al., 2021). The findings underscore that addressing technological immaturity and shortcomings is insufficient to boost adoption, as non-technological barriers related to institutional alignment and normative forces play a more critical role in highly regulated domains (Sangari et al., 2024). The failure of Tradelens, a blockchain-based supply chain platform developed by IBM and Maersk, underscores the challenge of fostering trust and cooperation in a highly competitive industry (Ying et al., 2024). Legal uncertainties regarding the enforceability of smart contracts and data stored in blockchain ledgers, particularly across borders, present additional risks for organizations (Sangari et al., 2024). Specifically, the immutable nature of blockchain records creates fundamental conflicts

with data protection mandates such as the "Right to be forgotten," which requires the deletion of personal data and is counterintuitive to the permanence of distributed ledgers (Kafeel et al., 2023). This conflict necessitates the development of complex legal and technical workarounds, such as off-chain storage solutions or cryptographic redaction methods, to reconcile the irreversibility of distributed ledgers with statutory requirements for data erasure and privacy (Alzahrani, 2021; Kaur et al., 2022). The lawful execution of smart contracts within a distributed ledger technology framework, particularly concerning issues such as enforceability, jurisdiction, and the application of contractual legal principles, remains a critical and contentious matter (Duan et al., 2024). This complexity is further compounded by the decentralized nature of blockchain networks, where nodes located in various judicial areas create uncertainty regarding which laws apply to executed transactions and which party should be held accountable in the event of a violation (Lustenberger et al., 2021). The lack of legal security and the absence of established legal solutions in cases of contract breach further complicate the operational viability of smart contracts within existing judicial systems (Ying et al., 2024). Consequently, organizations face significant challenges in reconciling the automated execution of code-based agreements with traditional legal doctrines regarding dispute resolution and liability (Anyanwu et al., 2023; Benabdellah et al., 2023).

Discussion

The analysis reveals that successful blockchain implementation in global commerce requires a holistic approach that transcends mere technical deployment to address the intricate interplay of legal, regulatory, and organizational factors. Specifically, the decentralized and cross-border nature of blockchain presents significant challenges in adhering to diverse regulatory frameworks across different countries and industries, as legal systems are often unprepared to address blockchain-specific concerns such as data ownership, accountability, and the enforceability of smart contracts (Baranidharan et al., 2025; Vermeulen et al., 2018). These jurisdictional ambiguities are particularly problematic because traditional legal principles based on geographic location do not easily apply to decentralized networks, making it difficult for courts and regulators to determine the applicable law and jurisdiction for disputes involving blockchain transactions (Szabó et al., 2024). Determining the appropriate liability framework and resolution mechanism for conflicts or technical failures remains problematic in the absence of a central entity administering the platform (Chandy & Bhardwaj, 2020). In permissioned blockchain environments, however, these challenges can be mitigated through governance structures that establish clear ownership and responsibility among known participants (Ganne, 2021). This stands in contrast to permissionless blockchains, where the absence of a central authority complicates the enforcement of regulations and the assignment of liability for incidents occurring outside conventional accountability structures (AllahRakha, 2024; Ganne, 2021). The lack of coordination and common understanding on how best to regulate blockchain technology at an international level could result in a "spaghetti bowl" of regulations that is ultimately more harmful than the lack of regulation itself (Chandy & Bhardwaj,

2020). Therefore, achieving international regulatory harmonization is essential to provide the legal certainty necessary for blockchain to function effectively within global supply chains and cross-border financial transactions (Syamsuddin et al., 2023). For blockchain to realize its full potential, regulatory and standardization efforts need to be harmonized across borders, requiring international bodies to work in close collaboration, share best practices, and learn from each other's experiences (Odulaja et al., 2023). Such global coordination is critical because blockchain is inherently transnational, meaning unilateral regulatory action anchored in territorial jurisdiction makes little sense and could lead to damaging regulatory fragmentation in the absence of cooperative frameworks (Ganne, 2021).

Conclusion

This study has demonstrated that while blockchain technology offers transformative potential for global commerce and financial infrastructure, its widespread adoption is currently constrained by significant legal, regulatory, and technical challenges that require coordinated international solutions. The findings suggest that without harmonized legal frameworks and standardized protocols, the interoperability of distributed ledger systems across different jurisdictions will remain a persistent barrier to seamless cross-border trade and financial integration (Odulaja et al., 2023; Tüfenk, 2023). Regulatory uncertainty and the absence of clear legal status for smart contracts further hinder the confidence of entrepreneurs and investors, necessitating the active involvement of intergovernmental organizations to update national legislation and provide the legal clarity required for commercial actors (Bomprezzi, 2021; Ganne, 2021). Future research should prioritize the development of unified international standards and governance models to address jurisdictional conflicts and liability issues inherent in decentralized networks (Chandy & Bhardwaj, 2020; Dereli, 2024). Such collaborative efforts between governments and industry stakeholders are essential to facilitate the seamless integration of blockchain technology into global supply chains and international trade networks (Chandy & Bhardwaj, 2020; Ejairu et al., 2024). The establishment of a comprehensive regulatory ecosystem, modeled on internet governance approaches that bring together companies, civil society, developers, academics, and governments, is critical to support the wide-scale deployment of blockchain technology (Chandy & Bhardwaj, 2020). This collaborative framework is necessary to provide the legal certainty and governance structures required to truly transform international trade (Ganne, 2021). Furthermore, addressing the technical challenge of interoperability between distinct blockchain networks is vital to prevent the fragmentation of the ecosystem and ensure that data can be shared effectively among diverse participants in global trade (Dereli, 2024; Kshetri, 2019). Ultimately, the transnational nature of blockchain technology demands a global regulatory approach that transcends national boundaries to foster innovation while ensuring legal compliance across jurisdictions (Ganne, 2021). The lack of universally agreed-upon standards results in issues with interoperability between different blockchains and compatibility problems between blockchains and legacy systems (Kafeel et al., 2023). The proliferation of various distributed ledger technology platforms, such as IBM's

Hyperledger Fabric, Microsoft's Ethereum blockchain, and R3CEV's Corda, has created a fragmented landscape where these systems cannot communicate or interoperate with one another (Sapian et al., 2021). This fragmentation limits the scalability and utility of blockchain projects, particularly in international trade where a single consignment may require interaction across finance, logistics, customs, and provenance ledgers (Chandy & Bhardwaj, 2020). This fragmentation limits the scalability and utility of blockchain projects, particularly in international trade where a single consignment may require interaction across finance, logistics, customs, and provenance ledgers, making it highly impractical for parties to host nodes on a dozen different platforms (Chandy & Bhardwaj, 2020). To overcome these barriers, effective platform governance mechanisms must be established to manage the strategic, technological, and interoperability requirements of a blockchain-based ecosystem (Jovanovic et al., 2022). As evidenced by the TradeLens platform, successful industry-wide adoption depends on robust governance that aligns incentives and manages the complex interactions among global supply chain actors (Jovanovic et al., 2022). These governance mechanisms must include strategic, technological, and interoperability frameworks to effectively manage the platform ecosystem and ensure seamless collaboration across diverse stakeholders (Jovanovic et al., 2022; Oriekhoe et al., 2024).

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