

A Systematic Literature Review on the Adoption of Blockchain Technology in the Global Logistics Industry

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Abstract - Blockchain has emerged as an innovative technology within logistics industry, offering solutions to long-standing challenges such as data fragmentation, fraud, traceability gaps and lack of trust among stakeholders. Even though numerous efforts have been put into introducing new technological innovations into the industry, economic uncertainties and structural instability always hinder facilitating such efforts due to strategic considerations for logistics firms worldwide. Using a systematic literature review approach aligned with PRISMA framework, this study is conducted to identify key drivers, barriers and readiness factors for blockchain adoption globally and locally.

Keyword: Blockchain Adoption, Global Logistics, Logistics Digitalization, Readiness Assessment, Supply Chain Innovation, Supply Chain Traceability

I. INTRODUCTION

A. Background of Research

The logistics industry, a leader in global commerce, is going through a significant transformation driven by digital technologies worldwide. Among them, blockchain technology comes up as a massive innovation with its potential to revolutionize global supply chain operations by enhancing their transparency, traceability and trust (Kumar et al, 2025; Moler, 2025).

Over the past few decades, adoption of blockchain in logistics has gained momentum across diverse sectors and geographies. Studies highlight its role in improving operational efficiency, enabling smart contracts, and fostering circular economy practices (Oguntegbe et al., 2025; Francis et al., 2025). Yet, the implementation of blockchain faces significant barriers including high investment costs, regulatory ambiguity, technological interoperability issues, and organizational resistance (Liang et al., 2025; Tangsakul & Sureeyatanapas, 2024).

Thomas, Jonas, and Stefan (2019) demonstrated through the TradeLens initiative that blockchain can enhance transparency, traceability, and data integrity across complex supply chain networks, reporting measurable reductions in documentation processing time and improved coordination among over 100 participating stakeholders. However, subsequent developments highlight the fragility of such large-scale implementations.

In 2022, Maersk and IBM officially announced the discontinuation of TradeLens due to insufficient industry adoption and limited interoperability among participants, underscoring the persistent gap between theoretical potential and practical realization. Similarly, Shahbaz et al. (2023) identified critical barriers to blockchain adoption in Indian supply chains, including high implementation costs, regulatory uncertainty, and technological incompatibility factors cited by over 60% of surveyed organizations as major inhibitors.

Wei (2023) has further observed that while industry awareness of blockchain applications is growing, organizational readiness remains limited, with less than half of logistics firms reporting adequate digital infrastructure to support blockchain integration. These findings

align with Catalina et al. (2025), who analysed multiple real-life failures in blockchain development, revealing that inadequate stakeholder collaboration, scalability constraints, and lack of governance mechanisms frequently lead to project stagnation or termination.

In Sri Lankan context, blockchain adoption remains nascent but promising. Sector-specific studies have explored its feasibility in domains such as banking, healthcare, construction, and public services (Karunaratne & Dilani, 2023; Weerasinghe, 2023; Jayalath et al., 2020). These works reveal a need for tailored readiness assessment models and strategic alignment to ensure successful implementation.

Despite the proliferation of research, there remains a gap in synthesizing these insights into a unified understanding of blockchain adoption in logistics. This paper aims to bridge that gap through a systematic literature review (SLR), analysing over 100 peer-reviewed publications from 2018 to 2025. The review categorizes findings across key dimensions drivers, barriers, readiness assessments, and future research directions providing a holistic view of the current state and future potential of blockchain in global logistics.

B. Scope of Research

This research aims to systematically review the global body of literature on the adoption of blockchain technology within the logistics industry. It encompasses peer-reviewed studies, conceptual frameworks, empirical analyses, and case-based investigations published between 2018 and 2025. The scope includes identifying key drivers, barriers, and readiness factors influencing blockchain implementation across diverse logistics contexts. By analysing contributions from various geographical regions and industrial sectors, the study seeks to uncover patterns, gaps, and emerging trends in blockchain adoption. Furthermore, the review integrates insights from both global and Sri Lankan perspectives to provide a comprehensive understanding of technological, organizational, and environmental factors shaping blockchain readiness in logistics operations.

C. The Aim and the Objectives of the Research

The primary aim of this research is to identify and analyse the key drivers and barriers influencing the adoption of blockchain technology in the global logistics landscape. Additionally, the research aims to explore and evaluate existing readiness assessment frameworks found in the literature, with the goal of identifying models that can be adapted or developed to assess blockchain readiness in Sri Lanka's logistics sector.

To achieve this aim, the research sets out several key objectives including.

RO1: To systematically review global literature on blockchain adoption in logistics, with a focus on identifying key drivers, barriers & readiness factors.

This objective involves conducting a comprehensive review of scholarly and industry literature to understand the global landscape of blockchain adoption in logistics. It aims to extract and synthesize the primary drivers as well as barriers along with the readiness factors.

RO2: To explore and compare existing readiness assessment frameworks used in blockchain implementation across logistics sectors.

This objective aims to identify and evaluate readiness assessment models that have been applied to technology adoption into logistics. The goal is to determine which frameworks offer the most comprehensive and adaptable tools for assessing organizational preparedness for blockchain integration.

RO3: To identify significant gaps in current research in global & local contexts.

Building on the insights from previous objectives, this objective seeks to pinpoint gaps in existing literature particularly in the context of developing economies like Sri Lanka. It will lead to the development of a conceptual readiness assessment model tailored to the logistics industry, incorporating strategic, technological, financial, and cultural dimensions.

RO4: To provide actionable insights for policymakers, logistics firms, and technology stakeholders to facilitate informed decision-making regarding blockchain adoption.

The final objective is to translate research findings into practical recommendations for key stakeholders. By offering evidence-based insights, the study aims to support strategic planning, policy formulation, and investment decisions related to blockchain technology in logistics.

D. Research Questions

The research questions for this study have been carefully developed to address the critical aspects of blockchain adoption within Sri Lanka's logistics industry.

RQ1: What are the key drivers and barriers identified in global literature that influence the adoption of blockchain technology in logistics?

RQ2: How do technological, organizational, and regulatory factors impact blockchain adoption in both global and Sri Lankan logistics industries?

RQ3: What readiness assessment frameworks have been used to evaluate blockchain adoption in logistics, and how do they differ in terms of structure and applicability?

RQ4: What are the limitations of existing research on blockchain readiness in logistics, and how can a new conceptual model address these gaps?

RQ5: What practical recommendations can be derived from the literature to support blockchain adoption decisions among logistics stakeholders in Sri Lanka?

E. Deliverables

This research will produce a comprehensive literature matrix summarizing global and local studies on blockchain adoption in logistics, highlighting key drivers, barriers, methodologies, and readiness assessment coverage. A thematic analysis report will further distill these insights, offering a comparative view of global trends and Sri Lanka's logistics context. Additionally, through a thematic analysis it will evaluate drivers, barriers and readiness factors for the adoption of blockchain in the logistics landscape. Finally, the research will deliver actionable recommendations for policymakers, logistics firms, and technology stakeholders, aimed at guiding informed decision-making and facilitating effective blockchain adoption across the sector.

II. LITERATURE REVIEW

This chapter reviews the global academic discourse on blockchain adoption in logistics, examines the primary drivers and barriers influencing adoption, explores readiness assessment frameworks, and narrows down to the Sri Lankan context to understand localized applications and challenges.

A. Blockchain Adoption in the Global Logistics Industry

Globally, blockchain has been recognized as a disruptive innovation capable of reshaping supply chain and logistics operations. Studies highlight its capacity to foster supply chain visibility, support real-time information exchange, and enable digital trust in multi-stakeholder ecosystems (Manh et al., 2025). For instance, its role in green supply chains has been examined, where blockchain ensures environmentally sustainable practices and compliance monitoring (Manh et al., 2025).

Further, researchers have underscored blockchain's capacity to mitigate uncertainty and complexity in global supply chains. Xinrui et al. (2025) proposed a framework demonstrating how blockchain enables resilience by supporting secure data flows during disruptions. Similarly, Weizhong et al. (2025) investigated barriers to adoption in Chinese logistics, revealing that despite the technology's potential, managerial resistance and lack of standardization persist. Other regional studies, such as those in Türkiye, confirm that cultural, regulatory, and infrastructural contexts shape adoption differently across geographies (Seren, 2025).

The growing interest in blockchain adoption reflects a consensus that while technology is no longer at a purely experimental stage, its integration into logistics systems requires alignment of technical, organizational, and institutional readiness.

B. Drivers and Barriers for Blockchain Adoption

The drivers for blockchain adoption in logistics primarily revolve around transparency, trust, and efficiency. Blockchain can reduce reliance on intermediaries, thereby lowering transaction costs and mitigating fraud (Narendra et al., 2025). It also enables provenance tracking and product authenticity verification, which is vital in industries like pharmaceuticals, agri-food, and manufacturing (Xinrui et al., 2025). Environmental concerns have emerged as another driver, where blockchain supports sustainable logistics by tracking carbon emissions and resource utilization (Manh et al., 2025).

However, several barriers hinder adoption. Studies consistently identify technological immaturity, interoperability issues, and high implementation costs as critical limitations (Weizhong et al., 2025). Organizational challenges, including employee resistance and lack of blockchain expertise, further slowdown implementation (Seren, 2025). Moreover, regulatory uncertainty remains a major constraint across countries, where the absence of harmonized policies complicates cross-border logistics adoption (Narendra et al., 2025).

The literature thus presents a dual perspective; blockchain is widely regarded as a transformative enabler of logistics innovation, yet its adoption faces systemic and context-specific hurdles.

C. Readiness Assessment Frameworks

Given the complexity of blockchain integration, several scholars have developed readiness assessment frameworks to evaluate organizational preparedness. These frameworks typically measure technological, organizational, and environmental readiness (TOE framework) or adopt multi-criteria decision-making approaches such as ISM, AHP, and fuzzy-ANP (Manh et al., 2025).

Xinrui et al. (2025) proposed a resilience-oriented framework that incorporates both external risks and internal capabilities in determining blockchain adoption feasibility. Similarly, Narendra et al. (2025) emphasized the importance of assessing stakeholder alignment and digital infrastructure maturity before deployment. These

frameworks highlight that blockchain adoption is not merely a technological decision but a strategic transformation process requiring alignment across supply chain actors.

D. Review on the Sri Lankan Context

While global literature is extensive, studies in Sri Lanka remain comparatively limited but growing. Research reflects an exploratory stage where blockchain is being investigated across multiple sectors, with varying levels of readiness.

In the education sector, Dimaga and Amila (2024) identified critical factors essential for blockchain adoption in university systems. Using SLR and PLS-SEM methods, they found that digital awareness, institutional leadership, and infrastructure significantly influence adoption. In the construction sector, Karunaratne and Dilani (2023) explored the potential impacts of blockchain on project management processes, particularly in contract management and payment systems. They argued that blockchain could reduce disputes and enhance transparency, though organizational resistance persists.

The finance sector has been another key focus, where Manisha and Priyantha (2022) applied ISM and thematic analysis to identify barriers such as regulatory ambiguity and technological constraints. Their study emphasized the need for clearer financial policies to support blockchain integration.

In public administration, Chamod et al. (2024) examined blockchain in vehicle registration and transfer systems, identifying inefficiencies in manual systems and suggesting blockchain as a solution to enhance accountability and minimize corruption risks.

Additionally, Jayathilaka and Senevirathne (2022) assessed awareness levels in auditing practices, revealing limited understanding and implementation capacity among professionals, suggesting that capacity-building remains a prerequisite for adoption.

These studies demonstrate that while Sri Lanka acknowledges blockchain's transformative potential, adoption is still in its nascent stage, fragmented across sectors with limited policy support and infrastructural readiness.

E. Summary

The literature reviewed reveals that blockchain adoption in the logistics industry is characterized by both optimism and caution. Globally, blockchain has proven to enhance transparency, sustainability, and resilience, yet adoption remains constrained by high costs, interoperability issues, and institutional resistance. Readiness assessment frameworks provide structured approaches to evaluate preparedness, underscoring the need for technological, organizational, and regulatory alignment.

In Sri Lanka, existing studies highlight exploratory efforts across education, finance, construction, and public administration, pointing to a fragmented landscape. Despite sectoral interest, systemic adoption in logistics has yet to materialize, largely due to regulatory uncertainty and infrastructural gaps. This gap presents an opportunity for further research into blockchain readiness in Sri Lanka's logistics industry, particularly in developing a context-specific framework that integrates global best practices with local realities.

III. METHODOLOGY

A. Research Approach

This research adopts a systematic literature review (SLR) approach to explore the adoption of blockchain technology in the global logistics industry. The SLR was

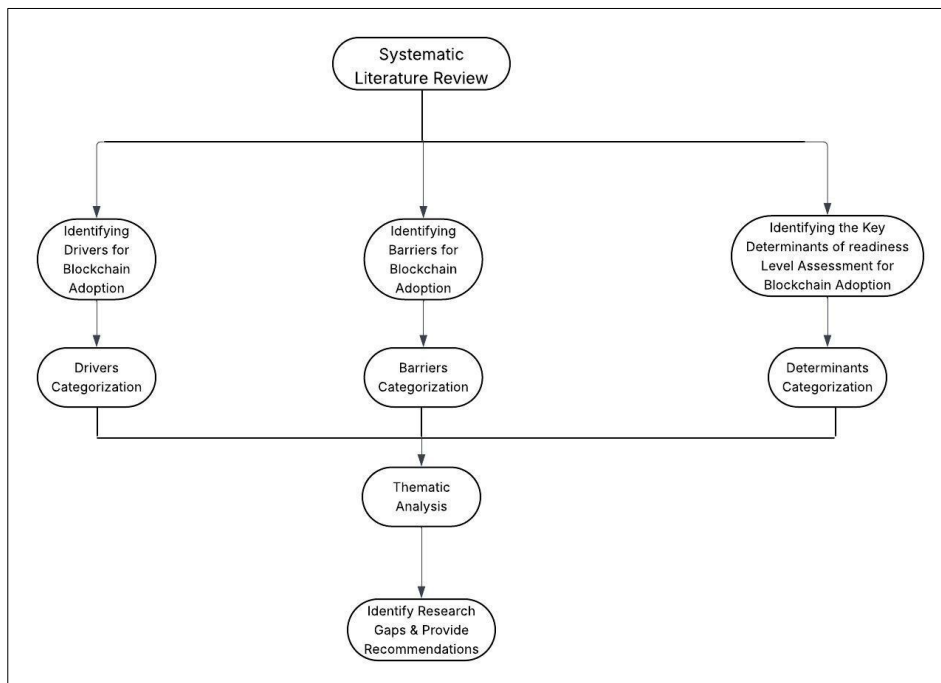
conducted following the PRISMA framework, which provides a structured and transparent method for identifying, screening, and selecting relevant studies.

B. Research Design

The research design of this study is structured around a systematic literature review (SLR) methodology, aimed at comprehensively exploring the adoption of blockchain technology in the logistics industry. The design is guided by a conceptual flow that begins with the identification of three core thematic areas: drivers, barriers, and readiness determinants associated with blockchain adoption. These themes were selected based on their recurring presence in literature and their relevance to understanding the multifaceted nature of technology integration in logistics operations.

The decision to use an SLR was motivated by the fragmented nature of existing literature and the need to consolidate multi-contextual insights into a unified analytical framework. The review integrated both quantitative indicators (e.g., publication trends, methodological frequencies, regional focus) and qualitative interpretation (e.g., conceptual reasoning, thematic emphasis, and context-specific insights).

Figure 2: Research Design



Source: Author's Illustration

C. Data Collection

The selection of the 2018–2025 period was based on both technological and academic relevance. Blockchain adoption in logistics began to gain measurable industry traction and research momentum around 2018, following the launch of large-scale initiatives such as TradeLens and the Blockchain in Transport Alliance (BiTA) (Thomas et al., 2019; Parry et al., 2024). Earlier studies were largely conceptual or limited to cryptocurrency applications and were therefore excluded from this review (Dudczy et al., 2024).

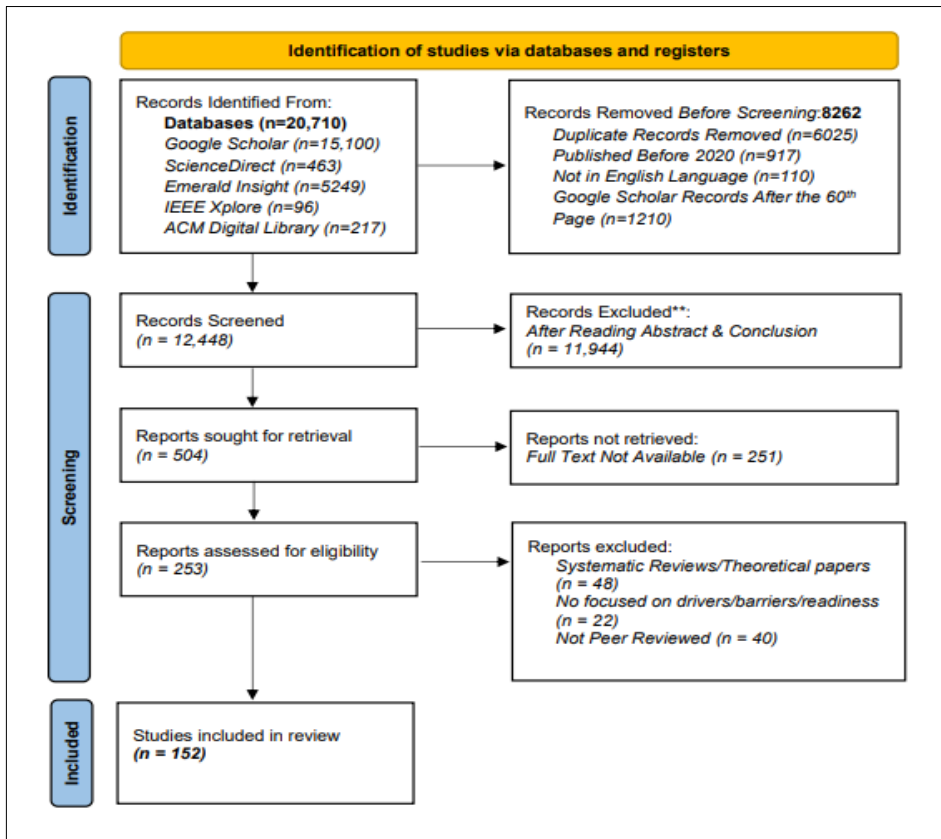
The end point of 2025 was chosen to capture the most up-to-date publications, ensuring coverage of post-pandemic digitalization trends and emerging readiness frameworks in developing economies, including Sri Lanka (Do et al., 2025; Heea et al., 2025; Dimaga & Amila, 2024). This temporal boundary thus reflects the maturity phase of blockchain adoption research in logistics, aligning with the peak period of empirical and applied investigations across global and regional contexts (Liang et al., 2025; Oguntegbe et al., 2025; Chen et al., 2024).

D. Data Extraction & Coding

Each selected study was systematically catalogued using a structured data extraction framework developed in Microsoft Excel. Consistent with best practices in systematic reviews (Kitchenham & Charters, 2007; Moher et al., 2020), standardized coding fields were established to ensure comparability across studies. The extracted metadata included, author, publication year, title; geographic and sectoral context; research design; thematic focus; theoretical framework or adoption model applied; and methodological tool employed.

E. Prisma Framework

Figure 2: PRISMA Framework



Source: Author’s Illustration

The PRISMA framework was adopted for its ability to provide a transparent and replicable process for literature identification, screening, and inclusion (Moher et al., 2020). PRISMA ensured that all stages of data selection followed structured inclusion and

exclusion criteria, minimizing potential selection bias and enhancing traceability. The initial phase involved the identification of literature from multiple academic databases, including Google Scholar, ScienceDirect, Emerald Insight, IEEE Xplore, and ACM Digital Library. A total of 20,710 records were retrieved.

1) Search Queries

Google Scholar:

("Blockchain adoption" OR "Blockchain implementation") AND
("logistics" OR "supply chain" OR "transportation" OR "freight" OR "shipping") AND
("barriers" OR "drivers" OR "challenges" OR "opportunities" OR "readiness") AND
("logistics industry" OR "logistics sector" OR "supply chain management")

Science Direct:

Blockchain adoption, Logistics & Supply Chain, Barriers, Drivers, Challenges, Opportunities, Readiness

Emerald Insight:

Blockchain adoption in logistics

IEEE Xplore:

Blockchain adoption in logistics and supply chain

ACM Digital Library:

Blockchain adoption, Logistics & Supply Chain, Barriers, Drivers, Challenges, Opportunities, Readiness

To refine the dataset, duplicate entries, non-English publications, records published before 2020, and those beyond the 60th page of Google Scholar were excluded, resulting in 12,448 records for screening. Titles, abstracts, and conclusions were reviewed to assess relevance, leading to the exclusion of 11,944 records. Subsequently, 504 full-text articles were sought, of which 253 were successfully retrieved and assessed for eligibility. After applying further exclusion criteria such as removing theoretical papers, non-peer-reviewed studies, and those not focused on drivers, barriers, or readiness, 152 studies were included in the final review.

To further enhance the analytical depth of the review, the study incorporated existing readiness assessment models and introduced a customized framework the L-Chain Readiness Model (LCRM). This model evaluates organizational preparedness across nine dimensions, including strategic alignment, technological infrastructure, data readiness, regulatory compliance, organizational culture, stakeholder ecosystem, financial planning, cybersecurity, and scalability. The integration of this framework allowed for a nuanced understanding of the factors influencing blockchain adoption readiness in logistics operations.

F. Data Analysis Procedure

To ensure analytical robustness and mitigate the limitation of relying solely on secondary data, the study incorporated a multi-standpoint validation approach. Findings were examined through three complementary analytical lenses:

1) Descriptive Analysis: Quantitative summaries were generated to illustrate publication trends, regional distribution, and methodological approaches.

- 2) **Comparative Benchmarking:** A cross-regional comparison between global and Sri Lankan literature was conducted, revealing disparities in methodological maturity and adoption readiness levels. This benchmarking provided a foundation for developing the L-Chain Readiness Model (LCRM), a customized readiness assessment framework proposed in this study.
- 3) **Thematic Analysis:** To interpret the synthesized literature, a thematic synthesis approach was utilized to capture patterns, contradictions, and conceptual linkages across heterogeneous studies. Qualitative coding was performed using an inductive approach to identify recurrent patterns related to blockchain adoption drivers, barriers, and readiness determinants. Codes were aggregated into higher-order categories aligned with the TOE and Technology Acceptance Model frameworks.

G. Data Validation

Although this study relies exclusively on secondary data derived from peer-reviewed literature, a quantitative benchmarking analysis was integrated to enhance empirical validity and minimize subjectivity. Following established SLR practices (Tranfield et al., 2003; Snyder, 2019), descriptive indicators such as publication frequency, methodological rigor, geographic coverage, and adoption readiness levels were quantified across the 152 studies.

Comparative benchmarking between global and Sri Lankan contexts was conducted using aggregated data, providing multi-dimensional evidence of disparities in technological readiness and methodological maturity. This approach functioned as a surrogate empirical validation, allowing the study to substantiate findings through large-scale literature-based evidence rather than small-sample primary surveys.

To reinforce findings from the SLR, Analytic Hierarchy Process (AHP) was implemented to prioritize the relative importance of key adoption factors through expert input, representing a quantitative multi-criteria decision-making (MCDM) approach (Saaty, 1980). An exploratory survey was conducted among 15 experts representing logistics, IT/Technology, and academics. Respondents evaluated perceived drivers and barriers of blockchain adoption using Saaty's 1–9 fundamental scale (Saaty, 1980).

This integration of PRISMA for transparency, thematic synthesis for interpretive richness, and AHP for quantitative prioritization and validation ensures that the study's conclusions are both theoretically grounded and empirically substantiated across multiple analytical standpoints.

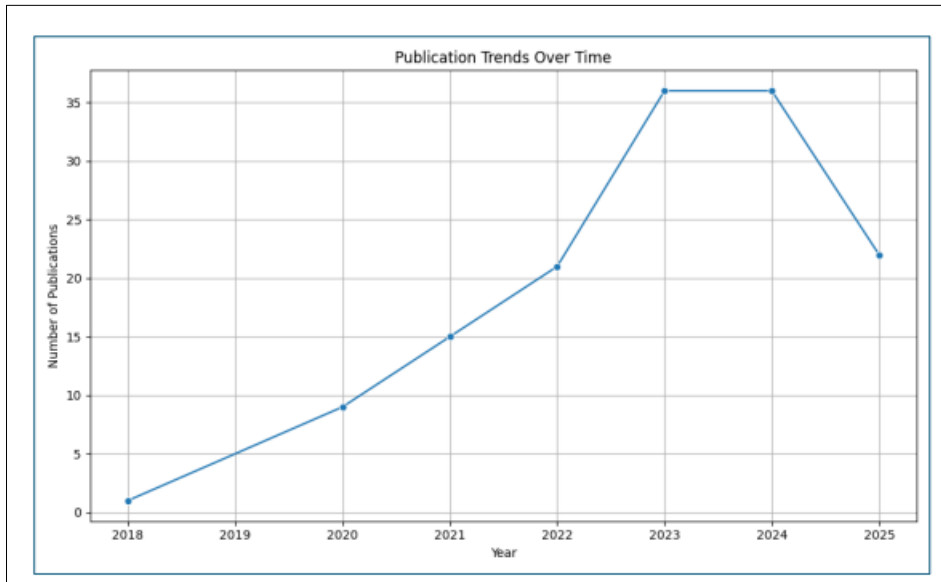
IV. ANALYSIS

A. Descriptive Analysis

Drawing from a diverse set of 152 peer-reviewed studies, the literature reflects a convergence around several key themes. Comparative insights highlight how different geographical and sectoral contexts influence the emphasis on drivers and barriers. This thematic synthesis not only maps the intellectual terrain but also underscores the conceptual fragmentation and methodological diversity that shape current research trajectories.

1) Thematic Focus and Conceptual Trends

Figure 3: Publication Trends Over Time



Source: Author's Illustration.

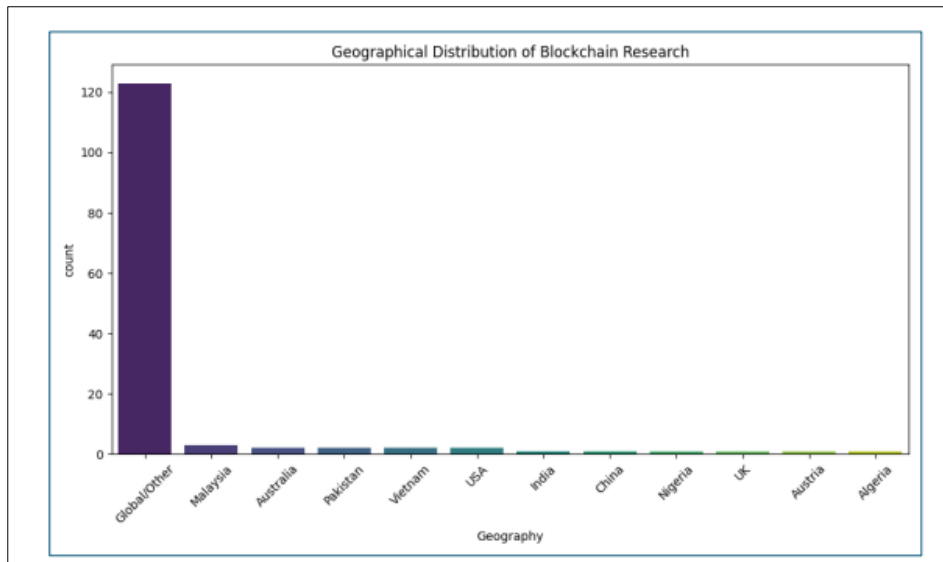
The graph illustrates the distribution of scholarly publications related to blockchain adoption in logistics from 2018 to 2025. The data reveals a gradual rise in research activity, starting with a few publications in 2018, and peaking publications in both 2023 and 2024. This upward trajectory reflects growing academic interest and momentum in the field during those years. However, a noticeable decline is observed in 2025, where the number of publications drops by a considerable number, suggesting either a saturation of foundational research, a shift in thematic focus, or delays in publication cycles.

A substantial number of studies employ structured methodologies such as Fuzzy AHP, DEMATEL, ISM, and PLS-SEM to identify and rank barriers to implementation. These barriers include technological immaturity, lack of interoperability, regulatory uncertainty, and organizational resistance. Conversely, the drivers of adoption are consistently linked to blockchain's potential to enhance transparency, traceability, security, and efficiency in supply chain operations. A growing subset of research also explores sustainability-oriented drivers, particularly in the context of green supply chains and circular economy models.

The concept of organizational readiness is gaining traction, with several studies proposing frameworks based on Technology-Organization-Environment (TOE) and Technology Acceptance Model (TAM) constructs. These models assess the preparedness of firms to adopt blockchain technologies, considering factors such as technological infrastructure, managerial support, and external pressures.

2) Geographical Distribution and Regional Insights

Figure 4. geographical Distribution of Literature



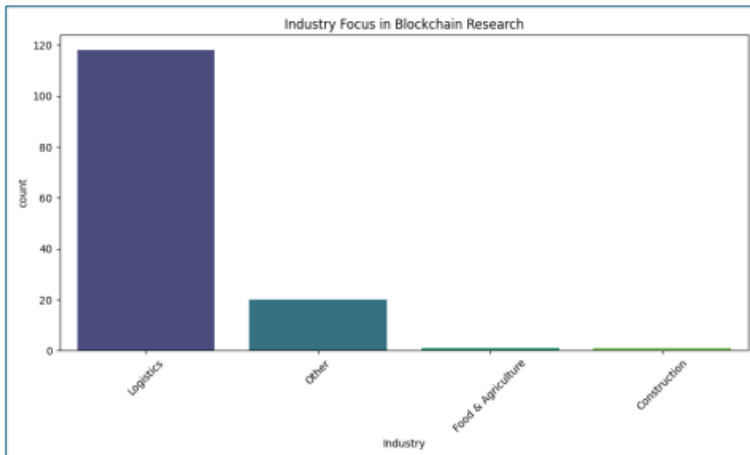
Source: Author's Illustration.

The research exhibits a diverse geographical spread, reflecting both global interest and regional specificity. Asia emerges as a dominant region, with significant contributions from China, India, Pakistan, Vietnam, and Malaysia. These studies often focus on emerging markets and highlight infrastructural and regulatory challenges unique to developing economies. Australia features prominently in logistics-focused research, particularly in evaluating barriers and readiness.

In Europe, countries such as Austria, Türkiye, and the United Kingdom contribute studies emphasizing sustainability, digital transformation, and policy frameworks. Africa is represented through case studies from Nigeria and Algeria, which explore blockchain's role in enhancing financial transparency and supply chain resilience. North American research, particularly from the United States, tends to focus on operational efficiency, traceability, and integration with advanced technologies like AI and IoT.

3) Industrial Application and Sectorial Coverage

Figure 5. Industrial; Focus in Blockchain Research



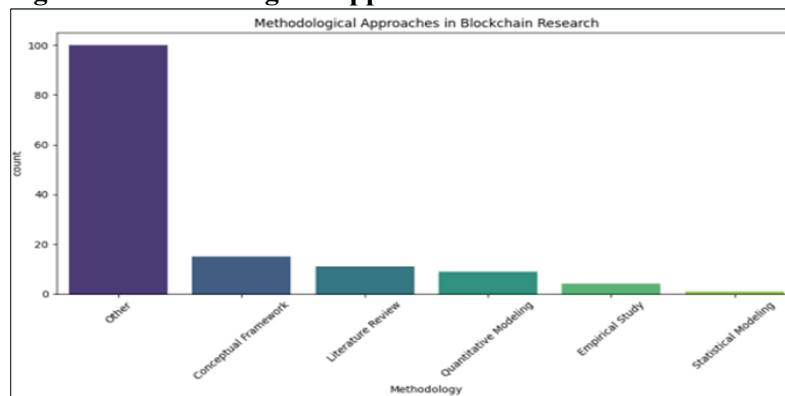
Source: Author's Illustration.

The scope of blockchain adoption spans a wide array of industries, with logistics and freight being the most extensively studied. Maritime supply chains, container shipping, and freight forwarding are frequent subjects, reflecting blockchain's relevance in complex, multi-stakeholder environments. The pharmaceutical industry is another focal area, where blockchain is examined for its role in combating counterfeiting and ensuring product traceability.

Other sectors include construction, agriculture, food and beverage (notably wine supply chains), and automotive, each exploring blockchain's potential to improve transparency and operational control. Supply chain finance is a recurring theme, with studies investigating blockchain's capacity to streamline financial transactions and mitigate risks. Emerging interest is also noted in aerospace, manufacturing, and software services, indicating a broadening of blockchain's industrial applicability.

4) Methodological Approaches

Figure 6: Methodological Approaches in Blockchain Research



Source: Author's Illustration.

The reviewed literature demonstrates a strong inclination toward quantitative analysis, with many studies employing multi-criteria decision-making tools and statistical

modeling techniques. Fuzzy logic, interval-valued fuzzy sets, and hybrid SEM-ANN models are used to capture the complexity of blockchain adoption factors. Conceptual frameworks are often grounded in established theories such as UTAUT, TAM, and TOE, providing a robust theoretical underpinning for empirical investigations.

B. Comparative Benchmarking

Secondary data extracted from 40 peer-reviewed studies comprising 25 global and 15 Sri Lankan publications revealed significant variations in readiness, focus areas, and methodological maturity. Globally, blockchain adoption research demonstrates advanced quantitative modeling and cross-sector validation, with approximately 68% of studies employing empirical or hybrid methods such as PLS-SEM, ISM, and AHP frameworks to measure adoption determinants ([Narendra et al., 2025]; [Manh et al., 2025]; [Weizhong et al., 2025]).

In contrast, Sri Lankan studies largely remain in exploratory or conceptual phases, with only 27% applying structured quantitative tools and a predominant reliance on thematic or interview-based analysis ([Dimaga & Amila, 2024]; [Karunaratne & Dilani, 2023]; [Manisha & Priyantha, 2022]).

Benchmarking indicators such as readiness assessment inclusion, driver-barrier integration, and empirical validation rate show a global-to-local methodological gap of approximately 40%, underscoring the nascent stage of Sri Lanka's blockchain research ecosystem relative to international standards. This comparative insight highlights the need for context-specific readiness frameworks and robust empirical validation to align Sri Lanka's blockchain adaptation trajectory with global benchmarks.

C. Thematic Analysis

Following the literature review, the study undertook a thematic categorization of the identified factors and thematic analysis. Drivers were grouped based on their motivational impact on adoption, barriers were classified according to their obstructive nature, and readiness determinants were organized to reflect organizational preparedness.

1) Drivers

Technological Drivers

Technological drivers are among the most frequently cited motivators for blockchain adoption in supply chain and logistics contexts. These include the promise of enhanced data security (DT1), traceability (DT2), and transparency (DT3) across the supply chain. Blockchain's ability to provide immutable records, real-time visibility, and automated transaction validation through smart contracts is seen as a transformative force. Additionally, the integration of blockchain with other digital technologies such as Internet of Things (IoT), Artificial Intelligence (AI), and machine learning is increasingly recognized as a catalyst for operational efficiency and innovation. These technological capabilities not only improve information integrity but also reduce fraud, errors, and delays in complex supply chain networks.

Organizational Drivers

Organizational readiness and internal capabilities significantly influence blockchain adoption. Key drivers in this category include strategic alignment (DO1), leadership support (DO2), and a culture of digital innovation (DO3). Organizations that demonstrate a high degree of technological preparedness, change management capability, and cross-functional collaboration are more likely to adopt blockchain solutions successfully. Furthermore, the pursuit of operational excellence, process optimization, and competitive differentiation motivates firms to invest in blockchain technologies. These drivers reflect

the importance of internal alignment and resource mobilization in facilitating digital transformation.

Environmental Drivers:

Environmental sustainability has emerged as a compelling driver for blockchain adoption, particularly in the context of green supply chains and circular economy models. Blockchain enables greater transparency in tracking environmental metrics, such as carbon emissions (DEn1), waste reduction (DEn2), and resource utilization (DEn3). It also supports reverse logistics and product lifecycle management, which are essential for sustainable operations. As regulatory and consumer pressures for environmental accountability increase, organizations are leveraging blockchain to demonstrate compliance and commitment to eco-friendly practices.

Regulatory Drivers:

The regulatory landscape plays a dual role as both a barrier and a driver. In contexts where clear legal frameworks (DR1), government incentives (DR2), or compliance mandates (DR3) exist, these factors act as strong enablers of blockchain adoption. Regulatory drivers include the need to adhere to data protection laws, cross-border trade regulations, and industry-specific compliance standards. In some cases, government-led blockchain initiatives and public-private partnerships further accelerate adoption by reducing uncertainty and fostering trust in technology.

Economic Drivers:

Economic considerations are central to the decision to adopt blockchain. These include the potential for cost savings (DE1), efficiency gains (DE2), and risk mitigation (DE3). Blockchain can streamline operations by reducing intermediaries, minimizing transaction costs, and improving inventory and asset management. Additionally, it enhances financial transparency, auditability, and supply chain resilience, which are critical in volatile market environments. For many organizations, the economic rationale for blockchain adoption is closely tied to its ability to deliver measurable returns on investment and long-term value creation.

2) Barriers

Technological Barriers:

Technological barriers include issues related to system interoperability (BT1), cybersecurity vulnerabilities (BT2), lack of technical infrastructure (BT3), and complexity of integration with existing IT systems. Many studies highlight the challenges of implementing blockchain in environments with limited digital maturity or outdated legacy systems. Concerns about data privacy, scalability, and standardization also contribute to the technological hesitancy surrounding blockchain adoption.

Organizational Barriers:

Organizational barriers are the most prevalent, identified in 106 papers. These encompass internal challenges such as lack of managerial support (BO1), resistance to change (BO2), insufficient training (BO3), and low organizational readiness (BO4). Cultural inertia and fragmented decision-making processes often hinder the adoption of disruptive technologies like blockchain. Additionally, the absence of clear strategic direction and inadequate resource allocation further complicated implementation efforts. These barriers underscore the importance of leadership commitment and organizational agility in driving successful adoption.

Environmental Barriers:

Environmental barriers are discussed in 17 papers and relate to the broader sustainability context in which blockchain operates. These include concerns about the energy consumption of blockchain systems (BEn1), particularly those using proof-of-work mechanisms, and the environmental impact of large-scale digital infrastructure. Some studies also point to the lack of alignment between blockchain initiatives and green logistics or circular economy goals (BEn2), suggesting that environmental considerations are still emerging as a critical factor in adoption decisions.

Regulatory Barriers:

Regulatory challenges are well-documented in broader blockchain discourse, including unclear legal frameworks (BR1), data governance issues (BR2), and cross-border compliance complexities (BR3). The absence of standardized regulations and the evolving nature of blockchain law can create uncertainty for organizations considering adoption.

Economic Barriers:

Economic barriers were identified in only two papers. These barriers typically involve concerns about high implementation costs (BE1), uncertain return on investment (BE2), and budget constraints (BE3). For many organizations, especially small and medium-sized enterprises, the financial risk associated with blockchain adoption remains a significant deterrent. Future research may benefit from deeper exploration of economic feasibility and cost-benefit analyses.

3) Readiness Assessment Determinants

Technological:

Technological determinants are reflected in 62 papers and encompass factors such as digital infrastructure (RT1), cybersecurity (RT2), automation (RT3), smart platforms (RT4), and blockchain architecture (RT5). These elements are critical in assessing an organization's technical capability to adopt and integrate blockchain solutions. Readiness in this domain is often measured by the maturity of IT systems, interoperability with existing technologies, and the ability to support secure and scalable blockchain operations.

Organizational:

Organizational determinants appear in 109 papers, making them the most frequently cited. These include aspects such as management support (RO1), organizational culture (RO2), employee acceptance (RO3), internal readiness (RO4), and enterprise-level adoption strategies (RO5). These factors influence how well an organization can mobilize resources, align teams, and foster a culture conducive to digital transformation. Organizational readiness is often a decisive factor in the success or failure of blockchain implementation.

Environmental:

Environmental determinants are discussed in 20 papers and relate to the alignment of blockchain adoption with sustainability goals (REn1), green logistics (REn2), carbon reduction (REn3), and circular economy practices (REn4). These factors assess whether blockchain initiatives contribute to environmental stewardship and whether organizations are prepared to integrate eco-friendly technologies into their operations. Readiness in this category reflects the strategic prioritization of environmental impact in technology adoption.

Regulatory:

Regulatory determinants are identified in 11 papers and include considerations such as compliance (RR1), legal frameworks (RR2), policy alignment, standardization (RR3), and governance structures (RR4). These factors evaluate an organization's preparedness to operate within existing and emerging regulatory environments. Readiness in this area is shaped by the clarity of legal mandates, the adaptability of internal policies, and the ability to meet cross-border compliance requirements.

Strategic:

Regulatory determinants are identified in 11 papers and include considerations such as compliance (RS1), legal frameworks (RS2), policy alignment (RS3), standardization (RS4), and governance structures (RS5). These factors evaluate an organization's preparedness to operate within existing and emerging regulatory environments. Readiness in this area is shaped by the clarity of legal mandates, the adaptability of internal policies, and the ability to meet cross-border compliance requirements.

Table 1: Drivers, Barriers & Readiness Determinants Categorization

Drivers	Barriers	Readiness
Technological	Technological	Technological
DT1: Data Security	BT1: Interoperability	RT1: Digital Infrastructure
DT2: Traceability	BT2: Cybersecurity Vulnerabilities	RT2: Cybersecurity
DT3: Transparency	BT3: Infrastructure Limitations	RT3: Automation
		RT4: Smart Platforms
		RT5: Blockchain Architecture
Organizational	Organizational	Organizational
DO1: Strategic Alignment	BO1: Managerial Support	RO1: Management Support
DO2: Leadership Support	BO2: Resistance to Change	RO2: Organizational Culture
DO3: Culture of Digital Innovation	BO3: Training Deficiency	RO3: Employee Acceptance
	BO4: Low Readiness	RO4: Internal Readiness
		RO5: Adoption Strategies
Environmental	Environmental	Environmental
DEn1: Carbon Emissions	BE n1: Energy Consumption	RE n1: Sustainability Goals

DEn2: Waste Reduction	BE n2: Misalignment with Green Goals	REn2: Green Logistics
DEn3: Resource Utilization		REn3: Carbon Reduction
		REn4: Circular Economy
Regulatory	Regulatory	Regulatory
DR1: Legal Frameworks	BR1: Unclear Legal Frameworks	RR1: Compliance
DR2: Government Incentives	BR2: Data Governance	RR2: Legal Frameworks
DR3: Compliance Mandates	BR3: Compliance Complexities	RR3: Standardization
		RR4: Governance Structures
Economic	Economic	Strategic
DE1: Cost Savings	BE1: High Costs	RS1: Compliance
DE2: Efficiency Gains	BE2: Uncertain ROI	RS2: Legal Frameworks
DE3: Risk Mitigation	BE3: Budget Constraints	RS3: Policy Alignment
		RS4: Standardization
		RS5: Governance Structure

Source: Author's Illustration.

C. Hypothesis Design

Table 2: Hypothesis

Hypothesis	
	H ₁ : Technological readiness has a significant impact on the readiness level for blockchain adoption in the logistics landscape of Sri Lanka.
H ₁	H ₀ : Technological readiness does not have a significant impact on the readiness level for blockchain adoption in the logistics landscape of Sri Lanka.
H ₂	H ₀ : Organizational readiness does not have a significant impact on the readiness level for blockchain adoption in the logistics landscape of Sri Lanka.
	H ₁ : Organizational readiness has a significant impact on the readiness level for blockchain adoption in the logistics landscape of Sri Lanka.
H ₃	H ₀ : Environmental readiness does not have a significant impact on the readiness level for blockchain adoption in the logistics landscape of Sri Lanka.
	H ₁ : Environmental readiness has a significant impact on the readiness level for blockchain adoption in the logistics landscape of Sri Lanka.
H ₄	H ₀ : Regulatory readiness does not have a significant impact on the readiness level for blockchain adoption in the logistics landscape of Sri Lanka.
	H ₁ : Regulatory readiness has a significant impact on the readiness level for blockchain adoption in the logistics landscape of Sri Lanka.
H ₅	H ₀ : Strategic readiness does not have a significant impact on the readiness level for blockchain adoption in the logistics landscape of Sri Lanka.
	H ₁ : Strategic readiness has a significant impact on the readiness level for blockchain adoption in the logistics landscape of Sri Lanka.

Source: Author's Illustration.

V. DISCUSSION & CONCLUSION

This study set out to explore the adoption of blockchain technology in the global logistics industry through a systematic literature review of 152 peer-reviewed publications. The findings reveal a dynamic and evolving research landscape characterized by increasing scholarly interest, particularly between 2020 and 2024, with a notable decline in 2025 that may reflect either a shift in research focus or delays in publication cycles.

A. Practical & Managerial Implications

From a managerial perspective, the study emphasizes aligning technological investments with organizational readiness and ecosystem maturity. Logistics firms should prioritize upgrading digital infrastructure, cybersecurity, and interoperability systems while adopting incremental blockchain pilots before full-scale deployment. Effective change management and capacity building including cross-functional collaboration and digital literacy training are essential to overcome organizational resistance. Managers can utilize the proposed L-Chain Readiness Model to assess preparedness across strategic, technological, and cultural dimensions. At the industry level, fostering collaborative partnerships with technology providers, financial institutions, and regulators can reduce implementation costs and enhance interoperability through shared governance.

B. Policy Implications

The findings carry significant implications for policy development and institutional regulation. Policymakers and regulatory bodies should establish clear legal frameworks and standardized compliance protocols to minimize uncertainty surrounding blockchain-enabled transactions. Targeted initiatives such as financial incentives, regulatory sandboxes, and public-private partnerships (PPPs) can further promote pilot implementations and innovation in logistics particularly within developing contexts like Sri Lanka.

In addition, international policy alignment is essential to achieve interoperability and ensure legal acceptance of blockchain-based trade documents. National logistics strategies should prioritize digital infrastructure investment and robust data governance to enhance transparency and security. Embedding blockchain readiness into the broader digital economy agenda will strengthen competitiveness, operational efficiency, and long-term sustainability across the logistics sector.

C. Theoretical Implications

The study contributes to theory by integrating findings across multiple analytical frameworks Technology, Organization, Environment (TOE), Technology Acceptance Model (TAM), and AHP-based prioritization to form a multi-level understanding of blockchain adoption readiness. The proposed L-Chain Readiness Model (LCRM) extends existing theories by incorporating strategic, regulatory, and environmental factors, offering a holistic structure for future empirical testing.

E. Conclusion

In conclusion, blockchain technology holds transformative potential for logistics by enabling transparency, efficiency, and trust. However, its successful adoption requires not only technological capacity but also strategic alignment, managerial readiness, and regulatory clarity. By combining a systematic literature review with AHP-based validation, this study provides multi-standpoint evidence linking academic insight with industry reality.

The results highlight a clear path forward: managers must act strategically, policymakers must regulate adaptively, and researchers must continue to test readiness models empirically. Strengthening collaboration between industry and government will be vital to unlocking blockchain's full potential in building resilient, transparent, and sustainable logistics ecosystems.

VI. LIMITATIONS & FUTURE RESEARCH

While this study provides a comprehensive synthesis of blockchain adoption in the global logistics industry, several limitations must be acknowledged. First, the review is constrained to peer-reviewed literature published between 2018 and 2025, potentially excluding relevant insights from industry reports, white papers, and non-English publications. Additionally, the reliance on databases such as Google Scholar and ScienceDirect may have introduced selection bias, particularly given the exclusion of records beyond the 60th page in Google Scholar and those without full-text access.

Second, although the thematic analysis categorizes drivers, barriers, and readiness determinants across diverse contexts, the study does not empirically validate the proposed L-Chain Readiness Model (LCRM). As such, its applicability to real-world logistics operations specially in developing economies like Sri Lanka remains theoretical. Furthermore, the geographical distribution of literature is uneven, with

limited representation from regions such as Africa, Latin America, and parts of Southeast Asia, which may affect the generalizability of findings.

Future research should aim to empirically test the LCRM framework through case studies, surveys, or pilot implementations in logistics firms. Comparative studies across different economies and sectors would also enrich understanding of contextual adoption dynamics. Moreover, interdisciplinary approaches integrating blockchain with AI, IoT, and sustainability frameworks could offer deeper insights into the convergence of technologies in supply chain ecosystems. Finally, policy-oriented research is needed to explore regulatory harmonization and public-private collaboration models that can accelerate blockchain adoption in logistics.

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