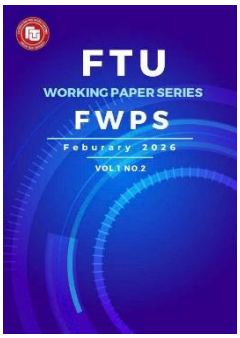

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TÍCH HỢP BLOCKCHAIN TRONG QUẢN LÝ CHUỖI CUNG ỨNG: NGHIÊN CỨU TRƯỜNG HỢP TRADELENS VÀ HÀM Ý ĐỐI VỚI DOANH NGHIỆP VIỆT NAM

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Tóm tắt

Nghiên cứu này xem xét việc tích hợp công nghệ blockchain trong quản lý chuỗi cung ứng thông qua nghiên cứu trường hợp nền tảng TradeLens, đồng thời rút ra các hàm ý đối với doanh nghiệp Việt Nam. Sử dụng phương pháp nghiên cứu trường hợp định tính dựa trên dữ liệu thứ cấp, nghiên cứu phân tích quá trình phát triển, mô hình vận hành, các điểm mạnh và hạn chế của TradeLens, với trọng tâm là những yếu tố dẫn đến việc nền tảng này bị ngừng hoạt động vào năm 2023. Kết quả nghiên cứu cho thấy, mặc dù sở hữu năng lực công nghệ mạnh mẽ, TradeLens đã gặp phải những thách thức then chốt liên quan đến cơ chế quản trị,

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sự lệch pha về động lực tham gia, khả năng tương thích hệ thống, chi phí triển khai và mức độ tham gia chưa đủ của hệ sinh thái. Trên cơ sở đó, nghiên cứu rút ra các bài học chiến lược cho doanh nghiệp Việt Nam trong việc áp dụng blockchain, tham gia các nền tảng số, cũng như xây dựng chiến lược chia sẻ dữ liệu trong quản lý chuỗi cung ứng.

Từ khoá: blockchain, nền tảng số, quản lý chuỗi cung ứng, TradeLens; doanh nghiệp Việt Nam

BLOCKCHAIN INTEGRATION IN SUPPLY CHAIN MANAGEMENT: A CASE STUDY OF TRADELENS AND IMPLICATIONS FOR VIETNAMESE ENTERPRISES

Abstract

This study examines blockchain integration in supply chain management through a case study of the TradeLens platform and draws implications for Vietnamese enterprises. Using a qualitative case study approach based on secondary data, the research analyzes the development, operational model, strengths, and limitations of TradeLens, with a focus on the factors leading to its discontinuation in 2023. The findings show that despite strong technological capabilities, TradeLens faced critical challenges related to governance, incentive misalignment, interoperability, adoption costs, and insufficient ecosystem participation. Based on these findings, the study derives strategic lessons for Vietnamese enterprises regarding blockchain adoption, platform governance, and data-sharing strategies in supply chain management.

Keywords: blockchain, digital platforms, supply chain management, TradeLens, Vietnamese enterprises

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1. Introduction

1.1. Background of the study

The global container shipping industry operates as a highly fragmented system involving multiple actors such as shipping lines, ports, customs authorities, freight forwarders, inland transport providers, and shippers. These actors rely on diverse information systems that lack common data standards, resulting in isolated and incompatible "digital islands" (Jensen et al., 2020; Nguyen et al., 2025). As a consequence, international trade documentation - including

bills of lading, certificates of origin, commercial invoices, and customs declarations - remains largely paper-based or dependent on static PDF files. This reliance on manual documentation slows down processes, increases the risk of errors, and raises vulnerability to document loss or manipulation, thereby increasing operational risks and compliance costs (Maersk, 2021; APEC, 2022; Hackius & Petersen, 2020). Moreover, the sequential transfer of documents across multiple intermediaries creates limited end-to-end visibility, often described as a "black box" in global supply chains (Levinson, 2016).

In response to these structural inefficiencies, blockchain technology (BCT) has been proposed as a potential solution for supply chain digitalization (Saberi et al., 2019). Permissioned blockchain systems offer distributed and immutable ledgers that allow authorized participants to share real-time and synchronized information without relying on a single central authority (IBM, 2018). In the supply chain management, blockchain has been primarily applied to the digitalization of trade documents, with the aim of improving transparency, traceability, and trust among supply chain partners.

TradeLens, launched in 2018 by A.P. Moller–Maersk in collaboration with IBM, was one of the most prominent blockchain-based platforms developed for the container shipping industry (Maersk & IBM, 2018). Built on Hyperledger Fabric, the permissioned platform aimed to create a standardized data-sharing environment connecting carriers, ports, customs agencies, inland transport providers, and shippers (Maersk, 2019a). At its peak, TradeLens involved hundreds of organizations, handled millions of container shipments, and demonstrated improvements in documentation processing speed and shipment visibility (Maersk, 2021). However, despite its advanced technological design and successful pilot implementations, TradeLens was officially discontinued in early 2023.

1.2. Research objectives

This study aims to examine the integration of blockchain technology in supply chain management through a case study of TradeLens and to derive implications for Vietnamese enterprises. The specific objectives are:

- To analyze the development and operational model of the TradeLens blockchain platform in the container shipping industry.
- To evaluate the strengths and limitations of TradeLens as a blockchain-based supply chain platform.

- To draw practical lessons and strategic implications for Vietnamese enterprises considering blockchain adoption in supply chain management.

1.3. Research methodology

This study adopts a qualitative case study approach. Secondary data are collected from academic literature, industry reports, and official publications by Maersk, IBM, and international organizations related to blockchain and logistics.

The research applies descriptive and analytical methods to examine the structure, objectives, and implementation of the TradeLens platform, followed by a critical evaluation of the factors contributing to its discontinuation. Finally, the findings are interpreted in the context of Vietnam's supply chain environment to derive relevant implications for Vietnamese enterprises.

2. Theoretical framework

2.1. Digitalization in supply chain management (SCM)

Digitalization in supply chain management refers to the systematic integration of digital technologies into supply chain processes with the aim to improve information transparency, coordination efficiency, and decision-making quality across organizational boundaries (Li, Zhou and Cao, 2025). According to Jenkins (2023), in global logistics networks, particularly container shipping, a multitude of links are included in supply chains from shipping lines, port operators, customs authorities, freight forwarders, inland transport providers, to cargo owners. Each traditionally operates its own information system in various geographic locations, leading to disconnected data flows and limited compatibility. Digitalization emerges as a response to these structural inefficiencies by seeking to replace manual, sequential, and paper-based coordination mechanisms with digitally enabled, real-time information exchange.

From a theoretical standpoint, SCM digitalization is closely linked to transaction efficiency and visibility. Digital systems reduce information asymmetry by enabling earlier and more accurate access to shipment data, documentation status, and operational events. Technologies such as electronic data interchange, port community systems, enterprise resource planning platforms (ERP), and cloud-based logistics solutions have provided a breakthrough in SCM by establishing a digital network that fully covers the entire chain, unifying data from procurement, inventory, sales, resulting in improvements in lead times, inventory coordination, and administrative accuracy (Yang, 2025).

However, former research has pointed out significant structural limitations in these conventional systems. Notably, Kshetri (2018) points out that such systems tend to concentrate power within a few dominant actors rather than fostering true decentralization. This centralization creates 'information silos' and trust deficits, as competing firms are often reluctant to share sensitive data on platforms they do not control. Furthermore, the complexity of aligning these digital tools with diverse international maritime laws and the inherent 'lawlessness' at the boundary between physical goods and virtual records remain unresolved challenges that hinder seamless collaboration (Kshetri, 2018).

In practice, these challenges are most visible in trade documentation, where workflows remain dominated by paper-based or partially digital processes. In emerging markets such as Vietnam, the digital divide is exacerbated by uneven technological capacity, outdated systems, and regulatory reliance on physical records (tcct and An, 2022). As a result, digitalisation initiatives in these contexts often yield incremental efficiency gains rather than fundamental structural transformation. This situation highlights the need for more decentralised and interoperable infrastructures capable of ensuring cross-organisational data integrity and trust. Moreover, fragmented documentation procedures create operational inefficiencies across supply chain actors. The persistence of manual verification mechanisms increases the likelihood of processing delays and coordination challenges. In cross-border trade, the absence of harmonised digital standards complicates information exchange among stakeholders. Consequently, incremental technological upgrades alone may be insufficient to address deeper structural constraints within global supply chains.

2.2. Blockchain in SCM

Originally developed to support Bitcoin, Blockchain Technology (BCT) has evolved into a sophisticated digital infrastructure with wide-ranging applications in supply chain management (Akram et al., 2020). As a form of Distributed Ledger Technology (DLT), blockchain enables secure data sharing and storage across a network of nodes, protecting information from unauthorised modification and corruption (Ar et al., 2020). Its decentralised architecture removes the need for a single central authority, thereby enhancing trust among participants. In supply chain contexts, this feature is particularly valuable where multiple independent actors must coordinate without fully trusting one another.

Blockchain technology is increasingly recognised as a transformative force in SCM due to its potential to improve transparency, traceability, and operational reliability. According to

Park (2020), blockchain adoption could increase operational efficiency by up to 40 percent and enhance competitiveness through greater visibility and financial resilience. The technology supports end-to-end traceability and asset tracking, making material, information, and financial flows more transparent and auditable throughout the supply chain (Vijai, Suriyalakshmi and Elayaraja, 2021). By creating tamper-resistant records, blockchain also reduces disputes, fraud risks, and documentation errors.

The decentralised nature of BCT further supports end-to-end traceability and asset tracking, making material, information, and financial flows throughout the supply chain more transparent and efficient (Vijai, Suriyalakshmi and Elayaraja, 2021). However, existing research consistently emphasizes that blockchain adoption outcomes are shaped less by technological capability than by organizational incentives and ecosystem conditions. Blockchain platforms generate value only when a sufficient number of participants contribute data and align processes. In competitive supply chain environments, concerns over data confidentiality, platform dependence, and strategic disadvantage may discourage participation. As a result, blockchain initiatives must be understood not merely as technical systems but as socio-technical platforms embedded within broader industry structures, governance arrangements, and regulatory environments (Tran et al., 2025).

3. TradeLens blockchain platform

3.1. Overview of Tradelens

3.1.1. Maersk's container logistics operations before TradeLens

The trade logistics of containers remains largely paper-heavy and disorganized, and the entire process is currently a tedious and manual task involving the coordinated efforts of the shipper, the carrier, the forwarder, the ports, the customs departments, and the banking community. Critical documentation such as bills of lading, certificates of origin, and commercial invoices was vulnerable to tampering, delays, and processing errors, slowing down the logistics chain (Maersk, 2021).

3.1.2. Objectives

Maersk and IBM launched the TradeLens, a blockchain solution, in 2018 with the aim of solving the challenges above by creating an open and neutral environment for container logistics (IBM, 2021). The solution aimed to deliver:

- Improved transparency through real-time access to reputable shipping information for authorised parties.

- Facilitating the secure sharing of data while ensuring the safeguarding of commercially sensitive data through permissioned access.
- Improvement of trust through immutable audit trails that mitigate the risk of document tampering.
- Enhancing the efficiency of operations through the digitization of business workflows, reduction of paper documents, and minimizing the time taken to process documents from days to minutes.

3.2. Timeline of deployment and global adoption (2018 – 2023)

The system, named TradeLens, started with pilot implementations in 2018 and gradually expanded to involve key carriers, over 100 ports and terminals, and hundreds of logistics providers (IBM, 2021). By 2021–2022, the platform was processing data representing nearly half of global containerized trade, demonstrating its significant operational potential (IBM, 2021). Nevertheless, although the system performed extremely well technically, issues arose that led Maersk and IBM to declare the end of the system's operations and stop the system's functions in early 2023 after announcing the discontinuation of the system during the late year of 2022 (Maersk, 2022). Despite the above, the five-year life of the TradeLens remains a key case study of the adoption of blockchain technologies within the world of supply chain management, and it provides key insights that ought to be used by other developing maritime states such as Vietnam.

3.3. Structure of TradeLens

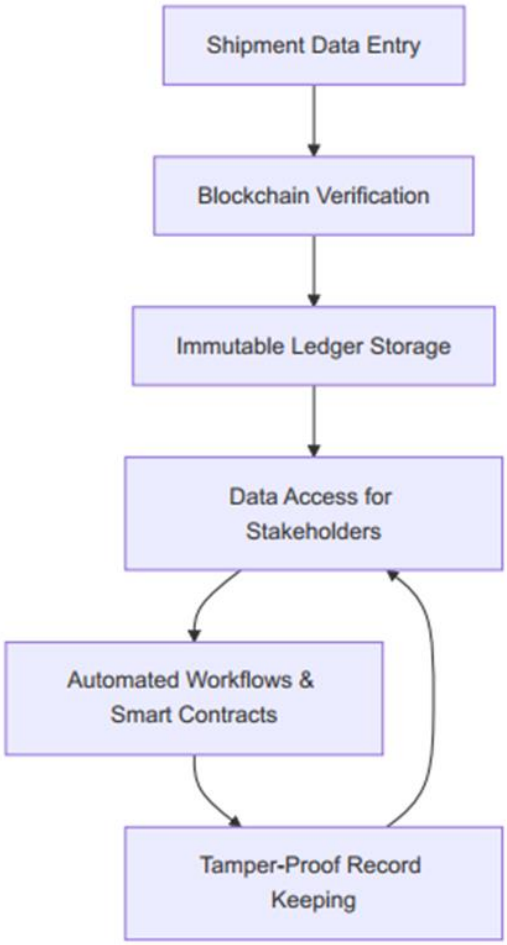

Figure 1. Structure of Maersk's TradeLens blockchain platform

Source: George, 2025

3.3.1. Shipment data entry

Shipment data entry is the initial phase where logistics actors - such as shippers, carriers, ports, and freight forwarders-input digital shipment information into the platform.

3.3.2. Blockchain verification

Once data is submitted, blockchain nodes verify the authenticity and consistency of the information using cryptographic validation processes. This verification mechanism strengthens trust among supply chain participants who may not have prior relationships and ensures data integrity across the network. According to IBM (2023), blockchain validation establishes a shared and trusted view of supply chain events. To be more specific, cryptographic validation processes include some steps. After submission, blockchain nodes verify the authenticity and consistency of the data using cryptographic validation mechanisms. TradeLens operates on a

permissioned Hyperledger Fabric network, where nodes are operated by Maersk, IBM, and other participating stakeholders, with distinct roles and permissions. Core nodes maintain the ledger and consensus processes; member nodes contribute updates, and observer nodes-such as customs authorities-have read-only access (IBM, 2023).

3.3.3. Immutable ledger storage

After verification, data is recorded on an immutable ledger that prevents unauthorized modification. Any update appears as a new transaction, allowing full traceability. Immutable ledger storage supports transparency, auditing, and the historical accuracy of logistics records. Saberi (2018) highlight immutability as a key driver of trust in blockchain-enabled supply chains.

3.3.4. Data access for stakeholders

The platform enables permission to data access, ensuring that only authorised actors-such as carriers, customs authorities, importers, and exporters - can view relevant information. This reduces information asymmetry while protecting privacy. Maersk emphasises that controlled access enhances coordination and efficiency across stakeholders in global trade (Maersk, 2019).

3.3.5. Automated workflows and smart contracts

Smart contracts automate tasks such as document validation, shipment milestone updates, and digital approvals. Once predefined conditions are met, the system executes workflows automatically. This leads to reduced manual processing and faster transaction cycles. Clearly, smart contracts help eliminate administrative bottlenecks in international supply chains (Frazer, 2025).

3.3.6. Tamper-proof record keeping

Blockchain ensures tamper-proof record keeping by generating audit trails for every transaction. Any modification attempt becomes visible, increasing accountability and supporting regulatory compliance. Hackius and Petersen (2017) note that tamper-proof documentation strengthens trust in digital supply chain systems.

4. Evaluation of TradeLens' strengths and limitations

4.1. TradeLens' strengths

4.1.1. Enhanced transparency and a shared single source of truth

TradeLens enables participants to access a unified and immutable record of shipping events and documentation across the entire logistics network. Through the application of blockchain technology, data from carriers, ports, customs authorities, and logistics providers are synchronised in real time, which significantly reduces information asymmetry among stakeholders. This transparency minimises the likelihood of disputes that often arise from inconsistent paperwork, missing records, or delayed status updates (Jensen, Hedman & Henningsson, 2020). In addition, the system improves operational efficiency because parties no longer need to repeatedly verify the same documents through manual communication channels. Maersk (2019a) also emphasises that this shared visibility allows organisations to base their decisions on accurate and up-to-date information, ultimately strengthening mutual trust and collaboration throughout the supply chain ecosystem.

4.1.2. Improved operational efficiency and faster documentation flows

A major strength of TradeLens lies in replacing traditional, paper-heavy processes with digitised workflows. Instead of relying on physical documents that are slow to circulate and vulnerable to loss or damage, the platform enables electronic data exchange that is faster, more secure, and easier to track. Automated data feeds from IoT devices, terminal operating systems, and carrier databases significantly reduce the need for manual data entry, which in turn lowers the probability of human error and shortens overall cargo processing times (APEC, 2025). The introduction of electronic bills of lading and other digital documents further streamlines cross-border documentation procedures, helping shipping companies and port authorities minimise port dwell time and avoid administrative bottlenecks (Maersk, 2019a). As a result, these efficiency improvements are frequently highlighted in industry assessments as major business value drivers, not only because they reduce operational costs but also because they enhance reliability and predictability within global supply chains.

4.1.3. High traceability and auditability enabled by blockchain

Blockchain architecture enhances the traceability of shipping activities by recording each event - such as gate-in, customs release or vessel departure - with tamper-evident timestamps. Cryptographic hashing mechanisms ensure that once information is written into the ledger, it cannot be modified or deleted without generating a detectable discrepancy, thereby strengthening audit trails and discouraging fraudulent behaviour (Jensen et al., 2020). This immutability is particularly valuable in international trade environments where multiple jurisdictions and documentation standards often complicate verification processes. Jovanovic

et al. (2022) further emphasise that verifiable data provenance not only supports more efficient regulatory reporting but also improves trust and confidence among trading partners, as all parties can independently validate the authenticity and history of shipment data.

4.1.4. Ecosystem integration and network effects

TradeLens was designed as a multi-stakeholder platform integrating carriers, ports, customs authorities, and inland logistics providers. When key actors such as Hapag-Lloyd and Ocean Network Express joined the platform, its ability to offer end-to-end visibility improved significantly (Maersk, 2019b). According to Henningsson and Hedman (2022), this ecosystem approach allows data to flow across organisational boundaries, facilitating coordination and reducing delays caused by fragmented information systems. The potential for strong network effects remains one of the platform's most important conceptual strengths.

4.1.5. Business value creation: Cost savings, fewer disputes, and better analytics

By consolidating shipment data into a single digital platform, TradeLens helps organisations reduce claims and disputes that often result from cargo handling mistakes or documentation errors (APEC, 2022). Shared access to real-time information allows all authorised parties to quickly detect and resolve discrepancies without relying on repeated manual verification. This unified visibility also increases accountability, as every transaction and update is logged and traceable within the system. Jensen et al. (2020) further highlight that the platform creates additional business value through improved analytics capabilities derived from integrated event data. With more consistent datasets, firms can better forecast delays, monitor logistics performance, and optimise resource planning decisions.

4.2. TradeLens' limitations

4.2.1. Lack of sufficiently strong incentives for participants

The cost structure of TradeLens, including development, maintenance, and onboarding costs, appears to have outpaced the value perceived by many participants.

Clearly, TradeLens failed to persuade shipper and freight-forwarder communities to adopt the platform. While TradeLens had strong participation from large ocean carriers and terminals, it did not succeed in recruiting critical mass among forwarders and shippers who did not perceive a clear commercial benefit. Shippers were unconvinced that the platform delivered sufficient additional value to justify paying extra for enhanced visibility, and many freight forwarders feared that Maersk's underlying interest was to reduce their role in the logistics

chain. Industry experts also noted that the incentives offered such as cost-efficient document management, competitively priced access to shipment information, or margin opportunities for onboarding clients were not compelling enough to drive their participation (PierNext, 2023).

Without strong participation from these groups, the platform's data coverage and network effects were limited, undermining the value proposition of a truly global, neutral logistics network.

4.2.2. Governance and power-structure concerns

The governance architecture of TradeLens generated persistent concerns regarding neutrality and competitive balance among industry participants. Many shipping lines and logistics intermediaries perceived the platform as being disproportionately influenced by Maersk, which led to doubts about whether decision-making processes and data policies could remain impartial over time. Such perceptions raised broader questions about data confidentiality, potential conflicts of interest, and the long-term consequences of sharing commercially sensitive information with a dominant market competitor. As a result, some firms hesitated to fully integrate their operations into the system, fearing strategic disadvantages or reduced bargaining power. These trust deficits ultimately discouraged wider participation and constrained the platform's ability to reach comprehensive, industry-wide adoption.

4.2.3. Interoperability and technological integration challenges

Although TradeLens demonstrated strong technical capabilities in event standardisation and real-time visibility, the platform nonetheless encountered significant structural barriers when integrating with pre-existing industry systems. Many logistics firms and port operators relied on legacy IT infrastructures that were not originally designed to communicate with blockchain-based networks, creating compatibility gaps and additional implementation costs. According to recent academic research, TradeLens employed several proprietary protocols and data standards that complicated system integration for external partners (Frontiers, 2025). This lack of seamless interoperability reduced the incentive for smaller or resource-constrained organisations to participate, as adoption often required substantial system upgrades or process redesign. Consequently, the limited compatibility between TradeLens and other digital platforms or legacy environments constrained network growth and slowed the platform's potential for large-scale ecosystem expansion.

4.2.4. Cost, vendor lock-in, and platform dependency risks

TradeLens required investment in integration, training, and ongoing platform fees. For many firms, especially small and medium-sized actors, these costs created significant barriers to entry (APEC, 2022). Jovanovic et al. (2022) highlight the strategic risks associated with depending on a single proprietary platform, including potential vendor lock-in and limited flexibility in future digital strategies.

Although each of the weaknesses above can be observed in different digitalisation initiatives across the maritime sector, in the case of TradeLens they interacted in a mutually reinforcing way that ultimately prevented the platform from achieving the scale required for long-term viability. Limited adoption among carriers and logistics service providers, combined with governance concerns over Maersk's role, hindered the development of strong network effects. At the same time, reluctance to share commercially sensitive data, high integration costs, and interoperability challenges slowed ecosystem expansion. These structural barriers contributed directly to the commercial underperformance highlighted by Maersk and IBM when announcing the platform's closure in 2022, demonstrating that TradeLens' weaknesses were not merely operational constraints but fundamental obstacles to sustainability.

5. Lessons for Vietnamese enterprises

5.1. Lessons from TradeLens' success

Despite its eventual discontinuation, TradeLens demonstrated several important successes that offer valuable lessons for businesses pursuing digital transformation through platforms.

5.1.1. Investment in shared data infrastructures

TradeLens shows that shared digital infrastructure can significantly enhance supply chain transparency and coordination (Sunny et al., 2020). By providing an unified and reliable data source, the platform reduced information asymmetry among carriers, ports, customs authorities, and shippers. Instead of relying on fragmented data stored in isolated organizational systems, stakeholders were able to access synchronized and near real-time information on shipment status, documentation, and logistics events. This leads to the conclusion that businesses should invest in synchronized data infrastructures that connect partners across organizational boundaries to deliver strategic value beyond internal efficiency gains. Such systems will improve responsiveness, support faster and better inform for making decisions as well as strengthen trust among supply chain partners, which is an important factor in volatile global trade environments.

5.1.2. Implementation of open standards and standardized API frameworks

Another important lesson from TradeLens lies in the operational benefits derived from standardization and interoperability. The platform's enforcement of common data standards enables firms with different IT systems to exchange information efficiently (Jovanovic et al., 2022). By aligning data formats and communication protocols, TradeLens reduced the need for repeated data reconciliation and manual intervention, which are common reasons of inefficiency in traditional logistics operations. This demonstrates that businesses gain greater long-term value from adopting open standards and standardized APIs than from relying on isolated, firm-specific digital solutions. Standardized digital interfaces enable firms to integrate more easily with partners, platforms, and regulatory authorities, lowering integration costs and supporting ecosystem-wide digital collaboration. For businesses operating in interconnected industries, standardization thus represents a strategic enabler rather than a technical constraint.

5.1.3. Strategic use of digital platforms

Through the TradeLens case, it is proven that digitalization can deliver measurable efficiency gains (Praveen Kumar et al., 2024). By automatizing documentation flows and replacing paper-based processes with electronic records, these processes which traditionally require manual handling, were streamlined through digital workflows, thereby reducing administrative workloads across the supply chain. Businesses therefore should view digital platforms not only as visibility tools but as mechanisms for cost reduction and process optimization. When properly implemented, digitalization can improve operational performance, reduce transaction costs, and enhance overall supply chain efficiency, contributing directly to improved competitiveness.

5.1.4. Inter-firm collaboration, even with competitors

TradeLens's initial success in onboarding major global carriers and hundreds of ports underscores the importance of broad ecosystem participation in realizing the full value of digital platforms. The platform's usefulness increased as more key stakeholders joined, enabling end-to-end visibility across multiple segments of the supply chain. For businesses, collaboration, even with competitors, can be essential when addressing macro inefficiencies that no single firm can solve independently. Industry-wide challenges such as documentation fragmentation, data silos, and coordination failures require collective solutions. Participating in shared platforms allows firms to benefit from network effects, improve interoperability, and jointly reduce inefficiencies that constrain overall industry performance.

5.2. Lessons from TradeLens' limitations

From a firm-level perspective, the case of TradeLens provides not only conceptual lessón but also clear guidance on how companies should strategically approach digital platforms in

complex and multi-actor industries. The most important implication is that firms must treat their participation in these platforms as a strategic investment decision rather than a purely technological upgrade.

5.2.1. Participation in neutral and transparent governance structures

Instead of joining platforms controlled by a single powerful competitor, companies should prioritize consortium-based or multi-stakeholder platforms in which governance mechanisms, voting rights, decision-making processes, and data access rules are clearly defined and collectively agreed upon. Such arrangements reduce power asymmetries and mitigate concerns over opportunistic behavior. In cases where participation in a market leader's platform is unavoidable due to industry standards or customer requirements, firms should proactively negotiate contractual safeguards. These may include strict data firewalls, limited visibility into commercially sensitive information, explicit restrictions on data reuse, and clear exit clauses. By embedding these protections into platform agreements, firms can benefit from digital collaboration while preserving their competitive advantages and strategic autonomy.

5.2.2. Selective and modular integration approach

The TradeLens experience shows that deep integration into a single platform significantly increases switching costs and the level of risk if the platform fails or is discontinued (Jensen, Hedman & Henningsson, 2019) . Such dependency can lock firms into unfavorable technological or governance arrangements and limit future strategic options. To mitigate this risk, firms should invest in API-based architectures, standardized data formats, and highly compatible IT systems that allow them to connect to multiple platforms simultaneously. This approach enables companies to capture the benefits of digital visibility and data sharing while maintaining strategic flexibility, redundancy, and credible exit options. From a risk management perspective, platform diversification becomes a critical component of digital resilience.

5.2.3. Alignment between digital platform adoption and measurable business incentives

Instead of adopting platforms just based on industry pressure or technological hype, companies should define measurable value targets, such as reductions in documentation processing time, dispute resolution cost or holding cost, before onboarding. Platform participation should begin with well-designed pilot projects that include specific performance benchmarks and time-bound evaluation criteria. Continued investment should be contingent upon demonstrable returns on investment rather than expectations of future network growth.

This ROI-based approach helps businesses avoid overinvesting in platforms that fail to reach expected value.

5.2.4. Internal digital readiness and capability development

The technical complexity in TradeLens highlights the need for internal data governance teams, standardized master data, and staff trained in digital workflows (APEC, 2022). Firms lacking such capabilities should pursue adoption strategies in each phase, beginning with basic data-sharing functions and gradually expanding toward deeper system integration. Collaboration with neutral technology providers, industry associations, or shared service platforms can further reduce technical barriers, lower costs, and close knowledge gaps. Building internal digital maturity thus becomes a foundational investment that determines the effectiveness of platform participation.

5.2.5. Adoption of data-sharing strategies

Rather than full data disclosure, companies should implement tiered data-sharing models that differentiate between operational data required for coordination, compliance information and commercially sensitive data that confer competitive advantage. Clear internal policies on data classification and access rights allow firms to participate in digital ecosystems while minimizing exposure to competitive risks. By carefully managing what data are shared, with whom, and under what conditions, businesses can leverage the benefits of digital collaboration without undermining their market position.

5.3. Future outlook

Looking ahead, firms are likely to become more strategic, cautious, and selective in their engagement with digital platforms. The failure of TradeLens signals that future success will favor platforms that combine technological capability with neutrality, economic sustainability, and governance legitimacy.

For firms, this means adopting multi-platform and ecosystem-oriented strategies rather than relying on a single dominant solution. Companies will increasingly spread digital engagement across multiple platforms including both blockchain and non-blockchain ones, depending on function, geography, and regulatory context. This diversification reduces dependency risk and strengthens bargaining power among platform providers. Moreover, firms with strong digital capabilities will gain a competitive advantage by leveraging platform data for advanced analytics, predictive logistics and real-time decision-making. Rather than viewing platforms merely as visibility tools, leading firms will integrate data from the platform into core strategic planning, risk management, and customer service processes.

In conclusion, the TradeLens experience underscores that firms succeed in digital transformation not by adopting the most advanced technology, but by making suitable strategic choices regarding governance, integration depth, data control, and economic value. Firms that apply these lessons proactively and carefully evaluate neutral governance selection, modular integration, ROI-based adoption, and balanced data-sharing, will be better positioned to capture the benefits of future digital platforms while avoiding the structural pitfalls that constrained TradeLens.

6. Conclusion

This study confirms that blockchain technology is pivotal for enhancing transparency and coordination in global supply chains through the case of TradeLens. While the platform demonstrated clear improvements in documentation speed and data integrity, its discontinuation proves that technological capability alone cannot ensure long-term viability. The findings indicate that success depends heavily on governance arrangements, incentive structures, and broad ecosystem participation. Critical barriers, including high integration costs, interoperability issues, and concerns over power structures, prevented TradeLens from achieving necessary network effects.

For Vietnamese enterprises, blockchain adoption must be approached as a strategic investment decision rather than a mere technical upgrade. Firms should prioritize platforms with transparent, multi-stakeholder governance to mitigate risks of dependency or competitive disadvantage. Investing in API-based architectures and open standards is essential to maintain modular flexibility and multi-platform connectivity. Additionally, businesses must strengthen internal digital readiness through data governance and staff training to effectively engage with digital ecosystems. Implementing tiered data-sharing models can help firms leverage ecosystem benefits while protecting commercially sensitive information. Ultimately, the TradeLens experience underscores that blockchain's value is realized only through the deliberate alignment of technology, governance, and economic value.

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