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Using Distributed Ledger Technology (DLT) to Combat Import Customs Tax Evasion A Game-Theoretic Approach

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ABSTRACT

This article examines the utilization of Distributed Ledger Technology (DLT) as a mechanism to address import customs tax evasion. The research employs a game-theoretic framework to examine the dynamics of tax evasion and assess the impact of blockchain on improving transparency, accountability, and compliance in customs administration. A systematic literature review process, adhering to PRISMA criteria, was utilized to gather and examine pertinent academic articles. The literature study examines critical subjects, such as the mechanisms of import tax evasion, the digital taxation framework, and the use of blockchain technology into tax systems. The study also examines the relevance of game theory in comprehending and addressing non-compliant behaviors among taxpayers. In the practical phase, we conducted a systematic review of a corpus exceeding 100 publications, obtained from three international research databases: Scopus, Taylor & Francis, and IEEE Xplore. Following the application of rigorous inclusion and exclusion criteria to guarantee relevance, a concentrated selection of research constituted the foundation for our study. This research underscores the capacity of DLT to transform conventional evasion tactics, reduce corruption, and improve institutional efficacy in customs operations. Insights are contextualized through a worldwide comparison and an examination of the Moroccan customs scene, offering concrete recommendations for utilizing blockchain to modernize customs operations.

INTRODUCTION

Import taxes are essential instruments in the context of global trade as they are significant revenue streams and cornerstones of economic policy for governments everywhere. The International Monetary Fund (IMF) believes that in many developing countries, customs fees account for a sizable amount of state revenue. These taxes also control markets, affect trade flows, and provide a large contribution to public spending (Black *et al.*, 2024). In essence, import tariffs are trade restrictions that affect the movement of products across international boundaries. Although they have the power to change patterns of international commerce, their main purposes are to safeguard home sectors from outside competition and to bring in money for the government. Tariffs are important economic policy tools that are especially important in international commerce. The International Monetary Fund (IMF) claims that customs taxes are a major government funding source, particularly in developing nations where other taxing methods may be more difficult to implement or less successful. These taxes also control markets, affect trade flows, and provide a large contribution to public spending (Black *et al.*, 2024). In essence, import tariffs serve as a barrier to entry for foreign goods, affecting trade patterns while also protecting domestic sectors and bringing in money for the government. Effective revenue collection and fair trade are seriously

hampered by the prevalence of tax evasion, which frequently involves actions like underreporting, misclassification, and fake paperwork. Governments lose billions of dollars in income as a result of dishonest businessmen avoiding lawful taxes through customs tax evasion (Collin, 2019). As seen by instances where textiles were misclassified in the EU or electronics were devalued in India, misleading declarations, under-invoicing, and tariff misclassification are frequent strategies. Compliance is further weakened by corruption in customs, which includes bribes and the acceptance of fraudulent claims. These losses can be reduced by bolstering enforcement with blockchain technology and AI-driven verification.

In international trade, tax evasion is still a major problem, and customs fraud causes large revenue losses. Unpaid customs tax bills in the United States totaled \$5.4 billion between 1993 and 2020, demonstrating the magnitude of the problem. False reporting and misclassification can contribute up to 6.6% of a country's GDP globally, with emerging economies being most affected (International Monetary Fund [IMF], 2020).

Traditional approaches to solving these problems haven't worked well enough. Though they haven't fully addressed the system's persistent inefficiencies, international organizations like the World Trade Organization (WTO) and the World Customs Organization (WCO) have taken measures to modernize customs procedures and harmonize tax regimes. A increasing number of

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academics and politicians are thus using cutting-edge frameworks and technology to solve these problems and update import taxing schemes.

Recently, blockchain technology has become a very promising invention, especially because of its capacity to guarantee data immutability, promote decentralized networks, and increase transparency. Interest in its use in global trade is growing, particularly in fields like import tracking and tax compliance. Blockchain has a big potential to combat tax evasion and enhance import traceability by creating safe and unchangeable transaction records. Smart contract integration also makes it possible to automate regulatory procedures, which might expedite customs procedures and lower the possibility of fraud or human mistake. Blockchain provides a new and efficient way to improve accountability and transparency in customs processes, which will eventually help combat corruption and evasion in international commerce, as noted by Kim *et al.* (2023).

Furthermore, the incorporation of Game Theory—a mathematical framework for examining strategic interactions between many actors—offers important insights into the activities of tax system players. In order to better understand and forecast acts like tax evasion, game theory may be used to simulate the interactions between governments, corporations, and people. This allows for the creation of more effective incentives for compliance. The application of game-theoretic models to enhance customs enforcement is examined in research by Aghaei, Cai, and Wu (2025), with a focus on how these models may be used for dynamic tariff changes and cross-border customs cooperation.

The purpose of this paper is to investigate how game theory and blockchain technology may be used to combat the rising issue of customs tax evasion. The study will look at how these two instruments complement one another and how they may be used to build a more open, effective, and just import tax collection system. The practical difficulties of applying these technologies in many international contexts—from affluent countries with fully digitalized economies to poor nations with high levels of corruption and inefficiency in their customs departments—will also be examined in this session.

This article will be organized as follows to give a thorough overview: An outline of the function of import taxes in international commerce, along with the difficulties that tax systems now confront, will be given in the first part. The efficacy of customs systems is hampered by corruption and tax evasion, which will be covered in more detail in the second part. The emergence of digital taxation systems and the technology behind this shift, such as blockchain, will be examined in the third session, which will also look at the digital transformation of customs operations. The potential of blockchain technology to combat customs tax evasion will be covered in the fourth portion, which will also cover important aspects like transparency and decentralization. The use of game theory to tax compliance will be discussed in the fifth

part, which will look at how strategic interactions may be modeled to enhance enforcement and lower tax evasion. The possible advantages and drawbacks of these technologies will be covered in the paper's conclusion.

In order to solve enduring inefficiencies in international commerce, this study aims to further the conversation on utilizing cutting-edge technology and theoretical frameworks. This study will shed light on the potential of Blockchain technology and game theory to modernize customs tax procedures and give stakeholders a road map for creating and putting these ideas into action..

LITERATURE REVIEW

Import Taxes and Tax Evasion: A Global Perspective

One way to boost a country's economic growth is by collecting duties and taxes, with import taxes commonly known as tariffs being one of the largest sources. National governments impose these fees on items that go across international boundaries. These tariffs, which were first imposed under the direction of the World Customs Organization (WCO), have several functions, such as safeguarding homegrown businesses and fostering economic growth in the country.

First and foremost, import taxes provide governments with the necessary funds to support infrastructure development and public services including public safety, healthcare, education, and transportation (Mikesell, 2017). The government can control the flow of foreign goods by adjusting import levies. By limiting excessive imports, this instrument contributes to the maintenance of a balanced trading environment. Because it enables them to shield domestic businesses from unfair competition, it is particularly significant for developing nations. To protect local companies against unlawful foreign activities and keep them from being overtaken by more established or less expensive foreign goods, governments can implement measures like antidumping tariffs. These safeguards are frequently essential for developing sectors to achieve long-term viability.

These types of taxes influence global trade policy far beyond being mere revenue-generating instruments. For example, governments may impose safeguard duties to protect domestic products when an exporting country engages in overproduction to undermine the market unfairly (Dursun, Amani, & Yawar, 2025). Additionally, by restricting the importation of products made with exploitative or ecologically damaging techniques, these policies might encourage ethical and sustainable activities. Governments may influence the market in ways that support both economic objectives and larger social ideals by carefully modifying tariff policy.

To ensure the establishment of a legal and fair customs system in every country across the world, international organizations have been constituted to oversee its proper execution, such as the World Trade Organization (WTO) and the World Customs Organization (WCO). The WTO, as the main regulatory body for international trade, enforces clauses and principles like the principle of

most-favored-nation treatment, which ensures that tariff policies are fair, transparent, and predictable (World Trade Organization [WTO], 2015). Stability in the international trading system is promoted by the WTO's framework, which is established through accords such as the General Agreement on Tariffs and Trade (GATT), which balances the various interests of its member nations.

Significant progress was made in simplifying trade processes with the implementation of the WTO's Trade Facilitation Agreement (TFA) in 2021. Lower trade costs worldwide, streamlined customs procedures, and less bureaucratic obstacles are the goals of this accord (Igbinenikaro & Adewusi, 2024). These policies are particularly advantageous for developing countries because they facilitate easier incorporation into international supply networks and offer chances to update antiquated customs procedures.

Despite all of these developments, successfully enforcing import tariffs is still a difficult task that is always changing. One major obstacle is the variation in tariff rates and enforcement strategies across countries because each country has its own national goods to protect. While some nations impose high tariffs to shield local industries, such as small and medium-sized enterprises (SMEs) in some countries for their first few years of production, others adopt minimal tariffs to encourage free trade. This disparity can create trade inefficiencies and lead to practices like tariff shopping, where companies reroute goods through countries with more favorable tax regimes (Igbinenikaro & Adewusi, 2024).

The digitization of international commerce, which has brought forth new solutions and addressed the issues of import taxes, is one way we have arrived at the current day. The Internet of Things (IoT) and blockchain technologies provide chances to improve the efficiency and transparency of global trade. But they also pose difficulties. For example, because many transactions involve intangible commodities or services that transcend borders digitally, the advent of e-commerce has made it more difficult to apply traditional tax regimes. This change calls for creative regulatory strategies that take into consideration how global commerce is evolving.

Import tax evasion is a significant issue globally. This problem is especially complicated in Asia, emphasizing the necessity of strong legal frameworks and efficient enforcement systems (Kurauone *et al.*, 2021). To stop customs tax fraud, the government of Bangladesh used to rely on pre-shipment inspection (PSI) services from organizations like Societe Generale De Surveillance SA and its subsidiary Cotecna. But in the end, these organizations helped people avoid paying customs duties, which is why Cotecna's certification was revoked in 2008 (Abi Nahed & El Samra, 2025). False statements, smuggling, document falsification, and bribery are examples of tax evasion in India, where the penalties range from 100% to 300% of the unreported revenue (Shehata *et al.*, 2023).

Prominent UAE residents engaged in tax avoidance via

the use of offshore accounts, as was revealed in the 2021 Pandora Papers leak (Hudson, 2022). German, French, Italian, Danish, and Belgian banks, stock dealers, and attorneys were all implicated in the \$62.9 billion cum-ex-files affair, which brought attention to a significant case of tax fraud in Europe (Wagner & Wei, 2023). The elaborate tactics used to avoid paying import duties, especially in nations with developed monetary systems, are exposed by this approach. Corruption and import tax evasion are interconnected in Greece, suggesting a systemic issue that damages tax revenue collection and public faith in government (Lois *et al.*, 2019).

Even Scandinavian nations like Sweden, which are known for their high tax compliance rates, have problems with import tax evasion, especially among the richest 0.01% of the population, who conceal a large amount of their income (Bernasconi *et al.*, 2020). This disparity brings to light larger problems with inequality and the limitations of conventional tax data, which fail to adequately reflect the financial dealings of the richest people. Import tax evasion is a rising problem in the UK, thus the government is cracking down by cracking down on offshore accounts and tripling down on prosecutions of tax evaders (Collymore, 2020).

In the United States, import tax cheating presents a considerable threat to the financial integrity of U.S. Customs and Border Protection (CBP). According to U.S. law, it is defined as a willful and unlawful effort to circumvent federal taxes. CBP faces significant hurdles in identifying activities like skimming and income non-reporting among certain groups because of the extensive investigations necessitated (Naidoo, 2013). A particularly significant practice is the exaggeration of charity contributions, with church donations frequently being a primary emphasis. CBP's figures highlight the magnitude of import tax fraud, with \$15 billion in evaded import taxes in 2001, escalating to \$20 billion in 2006.

In Kenya, substantial difficulties emerge in differentiating between legitimate methods and unlawful customs duty avoidance. Import tariffs may be avoided since a sizable portion of imported goods are either undervalued or unregistered (Kurauone *et al.*, 2021). In Ethiopia, examples of customs duty evasion include fraudulent invoicing, misclassifying commodities, and cross-border smuggling. This emphasizes the urgent need to address these issues by improved customs processes and stricter enforcement methods (Tadesse, 2023).

In Rwanda, customs duty evasion diminishes government income, obstructs public infrastructure projects, and intensifies economic inequality, highlighting the necessity for reforms in customs policy and administration (Kangave, 2005). These concerns illustrate widespread issues encountered by several African nations, where inadequate legislative frameworks and insufficient monitoring facilitate customs duty evasion, underscoring the necessity for strong, transparent, and efficient customs systems (Kurauone *et al.*, 2021).

Notwithstanding their intricate customs and taxation

frameworks, industrialized nations contend with the intricacies of worldwide commerce and sophisticated evasion strategies. Conversely, emerging nations encounter far greater obstacles.

The Digital Taxation Ecosystem

Utilizing the import taxation literature, we employ the ICT Ecosystem model (refer to Figure 1) to examine the pertinent literature on digital import taxation. The term 'ICT Ecosystem' was popularized by the Open E-policy Group, which defines it as the amalgamation of policies, strategies, processes, information, technologies, applications, and stakeholders that collectively constitute the technological environment of a nation, government, or organization. An ICT ecosystem fundamentally comprises persons who invent, purchase, sell, control,

manage, and utilize technology (Open E-Policy Group, 2005, p.3).

This definition indicates that 'technology' does not function in isolation, therefore a solely technological system is inadequate. The ecosystem approach recognizes that ICT applications must be integrated within a larger framework, taking into account the political, cultural, economic, and geographical qualities of their surroundings (Smith & Elder, 2010). The interplay of ICT among diverse players in distinct governance systems, innovation frameworks, economic policies, literacy levels, and citizenship practices result in the components of an ICT ecosystem differing among nations. Identifying these distinctions, especially between established and emerging economies, is essential (Rao & Jimenez, 2011).



Figure 1: The digital taxation ecosystem

Source: Created by the author.

Furthermore, it is essential to consider the many stakeholders vital for the efficacy of a functional ICT ecosystem. This necessitates comprehension of the social and demographic aspects that affect the engagement of diverse groups within a specific national environment. An exhaustive ecosystem study must consider variables like age, gender, social class, education, computer literacy, location, and more features (Rao & Jimenez, 2011). Digital import taxes corresponds with the ecosystem model, since its effective implementation relies heavily on the participation of entities outside customs and revenue agencies.

The extensive influence of import taxes on the economy impacting trade policy, company practices, tax compliance, and economic growth highlights the necessity for an ecosystem-based strategy (Xu, Li, & Liang, 2024). Chen, Jubilado, Capistrano, and Yen (2015)

contend that the efficacy of import tax administration and changes depends on robust coordination among customs officials, international trade organizations, and other essential players. Significantly, global entities, including the Platform for Collaboration on Tax, unite organizations such as the International Monetary Fund (IMF), the World Bank Group (WBG), the Organisation for Economic Co-operation and Development (OECD), and the United Nations (UN) to tackle matters concerning import taxation.

Consistent research by (Abdulkadir, Dauda, Mlanga, & Adebisi, 2024), we assert that the digital import taxation framework must acknowledge the following elements: the role of stakeholders, their motivations, and behaviors in their interactions with customs authorities and among themselves; the local context, especially the mechanisms through which digital import taxation is enabled and

advocated within national settings; the accessibility and cost-effectiveness of e-taxation services, encompassing both software and hardware; and the implications of implementing digital import taxation,

Blockchain Technology: Principles and Features

Satoshi Nakamoto unveiled bitcoin and its underlying technology to the public in 2008. Blockchain represents a significant advancement in the creation of decentralized information technology (Abeyratne & Monfared, 2016). Proponents contend that blockchain underpins commercial transactions with a significant degree of confidence due to its distinctive attributes (Risius & Spohrer, 2017). The blockchain network comprises several blocks, each with distinct identities and information, which are interconnected in a sequential manner. The information within a blockchain block is securely kept and cryptographically linked, preventing manipulation or alteration of the data in the network (Madavi, 2008). The transparency of data and information suggests that blockchain can offer accuracy and data security to servers inside the P2P blockchain network. Blockchain comprises interconnected blocks, each containing block hashes (digital fingerprints). A hashing algorithm enables each block in the network to identify its predecessor, creating an unbroken chain. A blockchain consists of interconnected blocks that collectively constitute a blockchain. Blockchain employs a ledger system that maintains a database in a decentralized and distributed manner, rather than in a centralized single system (Bambara & Allen, 2018). Consequently, there will be no administrative control center overseeing data within the blockchain network. Furthermore, any pre-existing data or information will be disseminated either secretly or openly to the servers inside the blockchain network. Blockchain is a digital ledger disseminated among all servers in a peer-to-peer network, enabling servers to authenticate and retain information stored on the blockchain network (Laurence, 2017). Three fundamental components of blockchain must be understood: the block, the chain, and the network (Lin & Liao, 2017). These constitute the fundamental components that may establish the blockchain framework. Conversely, certain sections inside each block (Bobde and al., 2024) comprise:

- a. Primary data: the fundamental data within the blockchain network.
- b. Hash: a distinctive digital identifier of data on the blockchain network that facilitates the sequential locking of blocks based on time.
- c. Timestamp: the data indicating the date and time when the transaction is recorded on the blockchain network.
- d. Additional information: blockchain participants ascertain what further content is included in the block. Each interconnected block will become a sequence of blocks, henceforth termed a blockchain. Upon the creation of a block, the current hash will execute the computation and produce a distinctive combination code

for the block. Simultaneously, the preceding hash serves as a link for all blocks, forming a blockchain.

Blockchain enhances data integrity, transparency, and auditability in accounting systems, reducing the risks of data manipulation and fraudulent practices (Barros *et al.*, 2025).

Each successive block will enhance the validation of the preceding block, hence facilitating the formation of the whole blockchain (Bobde *et al.*, 2024). If parties attempt to alter the data within a block, the hash of that block will consequently change. Subsequent blocks will be rendered invalid as they fail to retain the prior hash from the preceding block, resulting in a disruption of the network.

Blockchain and Taxation: Opportunities and Challenges

A number of countries such as USA, Singapore, Switzerland, Estonia, and even the United Arab Emirates (UAE), has been made a remarkable results by integrating the blockchain technology into their customs procedures, those decisions didn't just decrease the customs tax evasion but even enhancing effectiveness, security, and transparency of international trade operations. Estonia has been a leader in using blockchain technology into its e-governance services, including customs operations, to enhance accuracy and minimize vulnerabilities (Jalakas, 2018). The Australian Border Force has investigated blockchain technology to enhance customs declarations and bolster compliance in international commerce (Allen & Potdar, 2022). In the United States, while not adopted universally, some states and ports have trialed blockchain-based solutions for customs clearance to reduce tax fraud and evasion, demonstrating the nation's readiness to innovate in this area (Riggs & Vyas, 2022).

Blockchain, as an advanced inter-organizational process enhancement tool, goes beyond cryptocurrencies by reducing trust costs, enhancing financial performance, and mitigating customs tax evasion. By increasing transparency and traceability in trade processes, it significantly enhances tax administration systems. For example, Brazil's "bCPF" system, launched by the Federal Tax Administration, securely shares taxpayer data across government levels, while the Mercosur countries' "BConnect" platform, implemented in 2020, improved customs data transparency, reducing fraudulent imports by 12% (World Trade Organization, 2020). Moreover, the European Union's blockchain-based VAT system could reduce VAT fraud by 30% in cross-border transactions taking from the reports of OECD. Blockchain's ability to optimize customs taxing operations and reduce fraud is crucial for improving tax compliance (Kabwe, 2024). These achievements underscore the prospective advantages of using blockchain technology in customs regulations to combat tax evasion and enhance regulatory compliance in international commerce. Studies show that weak monitoring mechanisms directly reduce the efficiency of cross-border operations, causing delays and procedural congestion (Kamau *et al.*, 2025).

Table 1: Comparative Analysis of Blockchain Adoption in International Trade and Taxation Across Selected Countries

Country	Blockchain Initiatives	Regulatory Framework	Taxation & Compliance	Economic Impact	Fraud Prevention
Estonia	Blockchain for e-residency, digital IDs, and tax automation.	Strong legal framework supporting digital services.	Supports efficient tax reporting and compliance.	Boosts digital business and entrepreneurship.	Prevents unauthorized changes in tax records, ensuring security.
UAE	Dubai Blockchain Strategy 2020 for trade and logistics.	Proactive regulations in DIFC for blockchain.	Enhances tax and customs compliance, reduces evasion.	Streamlines cross-border trade, boosting economic activity.	Enhances transparency in customs to prevent false declarations.
USA	Blockchain in finance and trade, but lacking federal tax framework.	State-driven blockchain laws, federal progress underway.	State-level blockchain initiatives for tax verification.	Improves trade efficiency but limited by state-driven adoption.	Ensures integrity in financial transactions, reducing fraud.
Australia	Blockchain in supply chains and tax automation.	ATO exploring blockchain for tax processes.	Aims to improve real-time tax tracking and compliance.	Strengthens trade efficiency, contributing to export growth.	Blockchain tracks transactions in real time, reducing evasion.
Singapore	Blockchain in customs verification and digital trade.	MAS regulations supporting blockchain and digital assets.	Investigating blockchain for more accurate tax reporting.	Boosts trade volume and economic connectivity.	Prevents false invoicing and document fraud in customs.

Source: Compiled by the author based on data from OECD (2022), World Bank (2023), and government reports from Estonia, UAE, USA, Australia, and Singapore

The advantages comprise the subsequent attributes :

Transparency and Immutability in Customs Tax Compliance

The capacity of blockchain to improve transparency, mitigate tax evasion, and automate procedures has significant advantages for customs tax management. A primary concern in customs is the potential for underreporting or misclassification of products, resulting in the escape of customs charges. Blockchain technology can alleviate these issues by offering a transparent and immutable record of transactions, therefore enhancing customs compliance. Transparency and immutability are two interconnected attributes of blockchain technology. Transactions documented on the blockchain are accessible to all participants in real-time, establishing a transparent system where data can be independently validated (Mougayar, 2016). Immutability, stemming from cryptographic hashing, guarantees that each block in the chain possesses a distinct hash of the preceding block, so establishing an irreversible sequence. Altering a block necessitates modifying the hash of all future blocks, rendering record manipulation almost undetectable (Jiang, 2024) .

Enhanced Traceability in Customs Transactions

The real-time reporting capabilities of blockchain are

especially advantageous for customs agencies requiring current information on the movement and declaration of products. Blockchain technology enables customs authorities to oversee cross-border transactions in real time, facilitating prompt tax filing and mitigating delays that may be used for tax evasion. The capacity to monitor commodities and their corresponding duties across many jurisdictions enables customs officials to get secure, transparent, and precise data, hence diminishing the likelihood of misreporting customs duties (Anomah, Ayebofo, Aduamoah, & Agyabeng, 2024).

Cross-Border Customs Taxation and Blockchain

Blockchain technology is emerging and has the potential to completely transform customs tax procedures, particularly in the area of cross-border taxes. Swan (2015) believes that blockchain's decentralized and tamper-proof qualities offer a reliable tool for confirming tax compliance worldwide, assisting governments in reducing revenue losses due to fraudulent activities such as misdeclaration of items or undervaluation. Blockchain facilitates the streamlined computation of customs charges and currency translations, guaranteeing that customs duties are imposed precisely and uniformly, irrespective of the nation or jurisdiction (Jiang, Yao, Li, & Wei, 2024) .

Game Theory In Customs Taxes Administration

A useful framework for examining the complex dynamics of taxation systems, especially in relation to international commerce, is provided by game theory. Fundamentally, game theory examines how different actors—individuals, businesses, and governments—make decisions while accounting for the tactics used by other participants. Basic ideas that explain the formation of certain behavioral patterns include players, strategies, payoffs, and equilibrium points (such as the Nash equilibrium). The Nash equilibrium illustrates a situation in which individuals lack the incentive to alter their actions unilaterally, as they have already optimized their positions in relation to the strategies of others (Osborne & Rubinstein, 2020).

Game theory sheds light on the processes that interplay between nations when it comes to tariff setting. Raising tariffs can protect homegrown businesses and increase income, but they can also spark trade wars and retaliation from trading partners. This may be summed up as a sequential game in which the choice taken by one nation depends on its ability to predict the choices made by other nations. The Nash equilibrium in this context indicates a state where neither country gains from altering its tariff strategy independently (Osborne & Rubinstein, 2020).

Blockchain technology (BCI) profoundly alters the dynamics of these games. Blockchain enhances transparency and traceability, hence complicating tax evasion for people and corporations. Transactions documented on an irreversible ledger enable tax authorities to oversee trade activity in real-time, therefore diminishing the potential for fraudulent tactics such as underreporting or misclassification. This modifies the incentives in the

“game” of tax compliance by heightening the perceived risk of evasion, hence encouraging taxpayers to comply (Nakamoto, 2008).

The game-theoretic idea of mechanism design is especially pertinent to the potential of blockchain in taxes. This methodology emphasizes the creation of mechanisms that direct humans towards intended results. Blockchain-based smart contracts might automate the computation and collection of import taxes at the transaction point, minimizing manual involvement and potential for fraud. By integrating compliance measures into the system, governments may synchronize taxpayers’ incentives with social objectives, hence establishing a mutually beneficial scenario (Shehata *et al.*, 2023).

With the increasing acceptance of blockchain, a transition towards a new equilibrium characterized by transparency and efficiency in global commerce may occur. Countries that neglect to use such technology may encounter pressure to accelerate their adoption, as the advantages of diminished evasion and optimized procedures become increasingly evident. Ultimately, its extensive adoption may revolutionize the taxation framework, rendering compliance a normative practice rather than an optional one.

In conclusion, game theory offers a robust framework for comprehending and tackling the complexities of taxes. It elucidates the strategic interaction between governments and taxpayers, together with the dynamics of international collaboration. The emergence of blockchain technology is transforming the landscape, providing novel options to improve transparency, mitigate evasion, and promote a more cooperative global tax framework.

Table 2: Explanation of Key Concepts Related to Blockchain and Trade Compliance

Concept	Definition	Academic Explanation & Relevance
Blockchain	A digital, decentralized system for recording transactions securely and transparently.	Blockchain technology ensures data cannot be altered once recorded, promoting security and trust in financial and trade operations. Its applications extend to customs processes, reducing fraudulent declarations and enhancing traceability.
Customs Fraud	The act of intentionally misrepresenting imported or exported goods to evade tariffs or regulations.	Fraudulent practices include underreporting the value of goods, falsifying product classifications, or smuggling. Blockchain can counter these risks by offering a tamper-resistant, shared ledger accessible to regulatory authorities.
Tax Evasion	The illegal practice of avoiding tax payments through misreporting financial activities.	Evasion occurs through tactics such as false invoicing or offshore accounts. By enabling verifiable, real-time transaction records, blockchain enhances regulatory oversight, reducing tax fraud risks.

Source: Adapted from Allen & Potdar (2022) and other relevant literature.

MATERIALS AND METHODS

Methodology: Systematic Review (PRISMA)

This article employs a systematic literature review methodology. This is delineated by Fink (2019) as a systematic, clear, and reproducible approach for finding, assessing, and synthesizing an established corpus of

finished and documented work generated by researchers, academics, and practitioners. This review technique, distinguished by tight inclusion and exclusion criteria, differs from other literature reviews (narrative or scoping) in that it seeks to ensure a reproducible review process while minimizing bias. The authors use the PRISMA

criteria (Moher, Liberati, Tetzlaff, Altman, & Prisma Group, 2009).

Therefore:

- We decided on the keywords for the search
- We decided on the sources for the search
- Applied the keywords on the sources
- Used inclusion and exclusion criteria to arrive at the articles which were ultimately reviewed.

Search Strategy

Twizeyimana and Andersson (2019) assert that a systematic literature evaluation must concentrate on the principal publications within the pertinent topic. This study involved the collection of scholarly publications from four worldwide research databases: Scopus, Taylor & Francis, SpringerLink, and ScienceDirect (Zuiderwijk, Chen, & Salem, 2021). These databases were chosen for their extensive coverage of study fields pertinent to Distributed Ledger Technology (DLT), customs administration, and taxation.

To assure clarity and wide inclusion, the authors adopted a thorough definition of import customs tax evasion, which encompasses activities such as underreporting of goods, false valuation, tariff misclassification, and smuggling. With a focus on using DLT to increase accountability, transparency, and compliance in customs operations, this idea includes both technology and strategies meant to combat such behaviors.

The search phrases were separated based on the topic's intersection of two areas, Distributed Ledger Technology (DLT) and Customs Tax Evasion, and then merged using Boolean operators (AND/OR).

1. The first domain, DLT, featured keywords such as "Distributed Ledger Technology," "Blockchain," "Digital Ledger," "Smart Contracts," "Decentralized Technology," "Blockchain Applications," "Transparency Technology," and "Blockchain for Governance".

2. The second domain, Customs Tax Evasion, had keywords such as "Customs, Customs Administration, Import Tax Evasion, Customs Fraud, Customs Compliance, Revenue Leakages, Trade Facilitation, Tariff Evasion, Customs Enforcement".

Several combinations, including "Blockchain AND Customs Fraud," "DLT OR Import Tax Evasion," "Smart Contracts AND Tariff Evasion," "Blockchain AND Trade Facilitation," and others, were created using the Boolean operators. This methodology guaranteed a comprehensive investigation of the points of convergence between these two domains.

To enhance the literature base, other sources were also explored, such as OECD Reports, working papers, and technical materials on the application of blockchain in taxation and customs. Backward references from key articles further contributed to identifying additional relevant studies (Hassan & Hamari, 2020).

Study Selection

Despite the utilization of search terms, several

publications may remain irrelevant, especially concerning our study concerns, irrespective of the presence of keywords in the abstract, title, or both. Consequently, the authors needed to provide explicit inclusion and exclusion criteria. Publications that fulfilled the inclusion criteria were chosen for the study.

Inclusion Criteria

The following publications were included in the study:

- Published in English as peer-reviewed journal articles between the years 2000 and 2024.
- Where the subject of digitalizing customs taxation is central to the theoretical development, methodology, or findings of the study.
- Discussing at least one component of digital customs taxation as defined by the research of (Abdulkadir, Dauda, Mlanga, & Adebisi, 2024)
- Where the research output is accessible for evaluation by the researcher.

Exclusion Criteria

The following publications were excluded:

- Studies that include relevant keywords but do not focus specifically on digital customs taxation or any part of its ecosystem.
- Studies that focus on the taxation of e-commerce rather than customs tax.
- Studies that discuss digital customs taxation solely from a private sector management perspective.

To ensure scientific rigor, books, book chapters, conference proceedings, and other grey literature were excluded, as these are often not peer-reviewed or empirical (Dekker & Bekkers, 2015). The PRISMA Flow Chart in Figure 2 illustrates the process for determining which articles were included in the review.

Data Extraction and Analysis

One author carefully gathered data from all selected studies utilizing a standardized form that recorded essential facts, including authorship, publication year, country of emphasis, study aims, theoretical models or frameworks, and major findings (refer to Appendix A). The other writers subsequently checked and confirmed this information to guarantee its accuracy and consistency. The gathered data was further analyzed and classified utilizing the ICT Ecosystem framework, as detailed in the literature study, to investigate the function of Distributed Ledger Technology (DLT) in addressing import customs tax evasion from a game-theoretic perspective (refer to Figure 2).

Results of the Systematic Review

The characteristics of the 107 publications analyzed in this study are detailed below. Research on digital taxes has grown significantly, particularly between 2016 and 2024, as shown in Figure 3. In 2023, there were 26 publications, the highest number to date. This pattern demonstrates how the academic community has been paying more

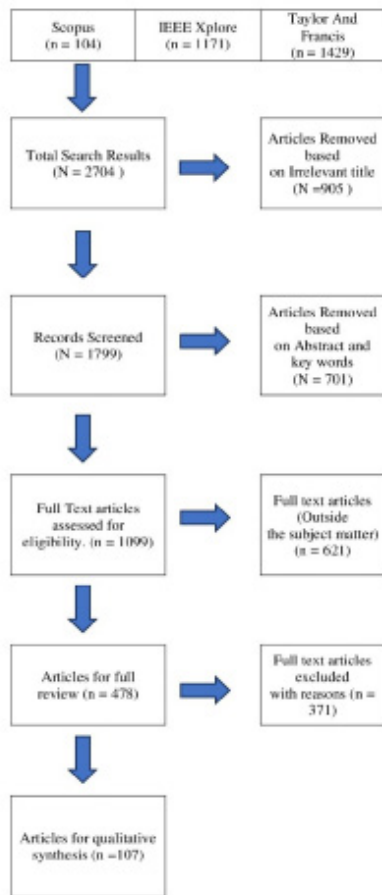


Figure 2: PRISMA flow chart.
 Source: Adapted from PRISMA criteria (Mober et al., 2009) and own data selection

attention to this subject in recent years.

We classified the study by nation and location in accordance with systematic review methodology. The majority of articles, as seen in Figure 4, concentrated on regions like Africa (17.8%), South Asia (18.7%), and Europe (19.6%). South America (1.9%) and East Asia (2.8%) are still underrepresented, though. 10.3% of the entire study was conducted globally, while 12.1% was conducted without a specific national emphasis.

Further, Figure 5 shows that research primarily concentrated on developing countries, which comprised 32.7% of the total publications. Developed countries followed at 29.9%, while mixed worldwide studies accounted for 25.2%. 12.1% of the studies had no particular national emphasis, highlighting the necessity of more geographically diverse research in the future.

The years 2000–2024 offer a thorough overview of the changing interest in digital taxes, highlighting differences in nation classifications and regional focus. This analysis calls for more inclusive studies, particularly in underrepresented regions and among developing economies.

Figure 6 illustrates that the range of techniques employed in publications within the international logistics and taxes industry demonstrates a pronounced inclination towards mixed-method approaches. Fifty of the 107 publications (46.7%) employ mixed methodologies, demonstrating that the integration of both quantitative and qualitative approaches is essential for delivering a thorough analysis of intricate issues, including the effects of taxation on global trade, the optimization of logistics strategies, and the influence of technology in enhancing international

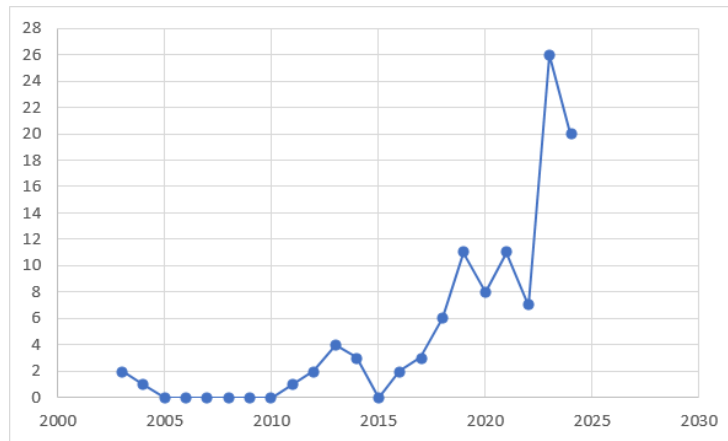


Figure 3: Year of publication.
 Source: Data compiled from articles selected in the systematic review (Own analysis).

business operations. Quantitative approaches are extensively employed, with 35 of 107 papers (32.7%) utilizing this methodology. This underscores the necessity for data-driven insights to evaluate the effects of fiscal policies on international commerce, cost management, and competitiveness, which are critical issues in logistics and taxes. Despite becoming less numerous, qualitative techniques remain significant. Twenty-two of the 107

papers (20.6%) utilize qualitative approaches, which are helpful in examining the contextual and institutional dimensions of international commerce, taxation laws, and logistical issues, especially in emerging countries.

Modeling with Game Theory

Game theory offers a comprehensive framework for analyzing the strategic interactions among different

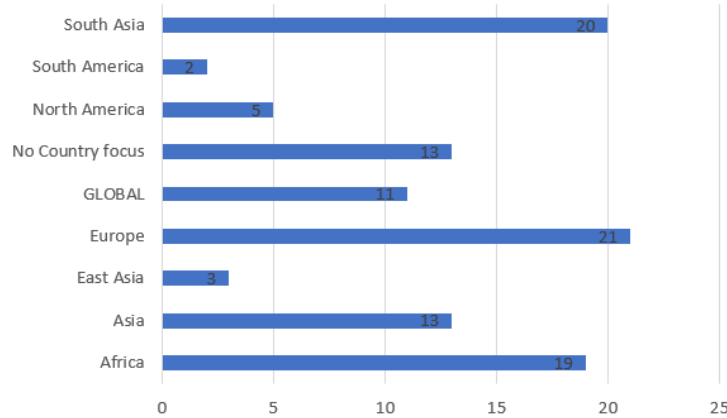


Figure 4: Journal publications by region

Source: Data compiled from articles selected in the systematic review (Own analysis).

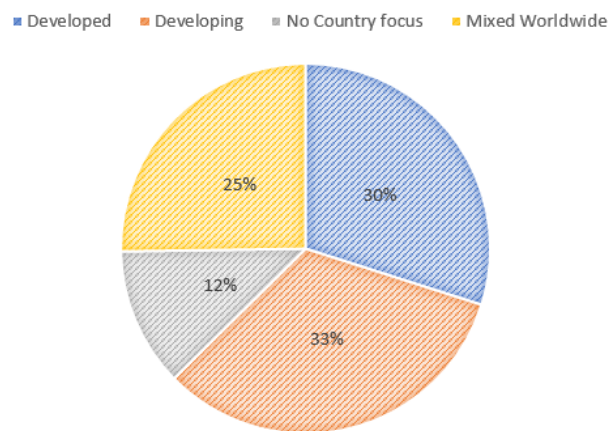


Figure 5: Publications by country development status.

Source: Data compiled from articles selected in the systematic review (Own analysis).

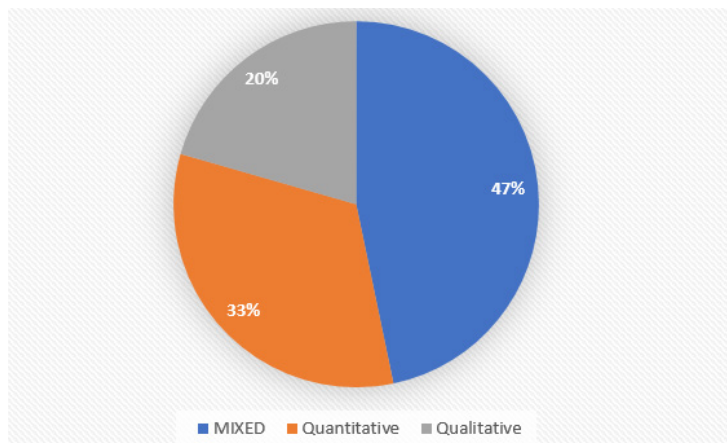


Figure 6: Publications by methodology

Source: Data compiled from articles selected in the systematic review (Own analysis).

stakeholders in customs and taxation. Modeling decision-making scenarios as games allows for the analysis of the behaviors of principal actors, including governments, enterprises, and tax authorities, as they pursue their own aims while reacting to the actions of others (Osborne & Rubinstein, 2020). there is more than one entity in customs systems stakeholders who aim to maximize their

profits. On the other hand, there are traders who seek to minimize their expenses and taxes. For example, the Prisoner's Dilemma is a relevant case that can be applied in this context to explain the challenges faced by these players between cooperation and self-interest. As a second example, we can mention a situation where two countries could benefit from aligning their customs taxes

to reduce trade barriers. Nonetheless, unilateral incentives, such as raising tariffs to enhance domestic income, might result in suboptimal results if both countries operate independently (Basu & Weibull, 1991). This interaction underscores the conflict between immediate advantages and enduring reciprocal benefits.

A prevalent paradigm is the Nash Equilibrium, when participants attain a stable strategy configuration such that no participant may enhance their outcome by independently altering their behaviors. In customs, this may illustrate a situation where enterprises regularly adhere to laws due to substantial fines for non-compliance, while governments impose acceptable tariffs and uphold transparent procedures to promote commerce (Klemperer, 1999). The use of blockchain technology in this scenario profoundly transforms the “game.” By improving transparency and minimizing fraud chances, blockchain alters payment structures, promoting more compliance and deterring evasion (Shinzeer, Kushwaha, & Bhagat, 2023).

Scenario 1: Before Blockchain – A Game of Corruption
In the conventional customs framework, the participants are the customs officials and importers. Their methods encompass several activities contingent upon their motivations. Customs officials may implement regulations, solicit bribes, or overlook discrepancies. Importers may either accurately declare products, undervalue them, or resort to bribery to avoid taxation.

The rewards for both sides frequently go toward corruption. An importer in Morocco misrepresenting the worth of imported textiles to diminish customs charges presents a quandary for the customs inspector. Should they acquiesce to a bribe and disregard the deception, or fulfill their obligation and report the anomaly? This reflects a traditional “prisoner’s dilemma” in which both sides may behave selfishly to optimize personal benefits, resulting in revenue losses for the state and a compromise in market transparency (Sandoval, 2020).

Scenario 2: After Blockchain – Transparency as a Strategy

The advent of blockchain substantially alters this dynamic. Blockchain technology functions as an impartial and immutable ledger, publicly and securely documenting transactions, hence diminishing discretionary authority and potential for corruption. This new system incentivizes customs officials to enforce compliance with integrity, while importers are more inclined to report items properly due to the ease of tracing inconsistencies (Kozan & Porcher, 2025, p. 145).

Examine Morocco’s digital transformation efforts, including the PortNet system, which enhances trade operations through process digitization. Integrating blockchain into customs processes enables the automated cross-verification of the claimed value of imported electronics with international market data. An importer seeking to underreport the value of products would encounter a system that promptly identifies discrepancies. Likewise, customs officials will possess restricted

opportunities for fraudulent operations, since blockchain guarantees total transparency of all documented transactions (Boutafert, 2024).

Discussion And Implications

Blockchain’s Impact Through Game Theory

The use of blockchain technology, especially smart contracts, has the potential to profoundly alter the nature of economic transactions in Morocco. Grounded in game theory principles, blockchain provides a decentralized framework in which trust is an inherent system attribute rather than a tenuous human consensus.

Our findings are consistent with Barros *et al.* (2025), who argue that blockchain strengthens internal control processes and reduces opportunities for data manipulation.

Because smart contracts are self-executing agreements, they are crucial for eliminating opportunistic conduct. Opportunistic conduct, such as breaking agreements or taking advantage of legal loopholes, is a persistent issue in Morocco’s trade and financial institutions, because transactions usually include several players with varying levels of power and influence. In addition to being time-consuming, traditional risk-reduction strategies like legal remedies also depend on institutional capacity, which isn’t always sufficient (Nakamoto, 2008; Tapscott & Tapscott, 2016).

Smart contracts are engineered to automate and enforce conditions, guaranteeing compliance without the necessity for external arbitration. In a situation between Moroccan exporters and overseas purchasers, the transfer of commodities might be directly associated with the disbursement of money via a blockchain-based smart contract. This removes the incentive for either partner to behave opportunistically, as neither can alter the process after the conditions are established and encoded (Szabo, 1997).

This alignment significantly influences industries like agriculture and artisanal commerce, which are vital to Morocco’s economy. By diminishing dependence on middlemen and establishing agreements using smart contracts, manufacturers and suppliers can concentrate on value generation rather than protecting their interests.

Increased Cost of Fraud

A prominent repercussion of blockchain is the substantial rise in the expense associated with fraudulent operations. In opaque systems where records are easily manipulated or altered, fraud often thrives. By creating a distributed ledger that cannot be altered in the past without the consent of network users, the core characteristics of blockchain—immutability, transparency, and decentralization—reduce these dangers (Narayanan *et al.*, 2016).

In Morocco’s agricultural export business, fraudulent certifications and modified shipping documents have always posed difficulties for overseas purchasers. Blockchain technologies guarantee that every phase, from manufacturing to shipment, is documented clearly

and verifiably. The unchangeability of these data renders fraudulent endeavors both technically difficult and economically unfeasible, since the resources needed to compromise blockchain systems exceed the potential benefits of fraud. Consequently, those with malevolent intentions are successfully deterred. These findings are consistent with Serifat *et al.* (2025), who show that AI can strengthen fraud detection capabilities, supporting the argument that combining AI and DLT could significantly enhance integrity in customs operations.

Strengthened Incentives to Comply with Rules

Game theory underscores the need of matching incentives to promote cooperative conduct among participants. Blockchain enhances these incentives by integrating

compliance procedures into the system. In the Moroccan context, smart contracts—self-enforcing agreements inscribed on the blockchain guarantee that all parties meet their responsibilities before to the completion of transactions (Buterin, 2014).

In Moroccan SMEs involved in cross-border commerce, a smart contract can disburse payment to a supplier just upon confirmation of products delivery. This eliminates the dependence on trust among parties, as the mechanism mandates adherence. The openness of blockchain records fosters a reputational motivation. Participants are aware that their acts are observable by all, rendering breaches of agreements or regulations detrimental, since such conduct may adversely affect their reputation and future commercial opportunities (Catalini & Gans, 2016).

Table 3: Challenges to Blockchain Adoption in International Trade

Challenge	Real-World Data	Impact on Blockchain Adoption
High Costs & Complexity	52% of organizations cite this as a barrier .	High initial investment and complexity in deployment hinder widespread adoption.
Technical Limitations	60% of businesses in developing markets face difficulties in integration	Lack of technical infrastructure and skilled personnel complicate blockchain adoption.
Legal & Regulatory Uncertainty	38% of global firms are concerned with unclear regulations.	Ambiguity in legal frameworks slows down the integration of blockchain in international trade.
Public Procurement Compliance	Estimated that corruption costs the global economy up to \$2.6 trillion annually (World Bank).	Blockchain can improve transparency, reduce corruption, and ensure compliance in procurement.

Source: Compiled by the author based on data from OECD (2022), World Bank (2023), And IMF (2023)

Moroccan Customs: Challenges and Opportunities

The use of blockchain technology into Moroccan customs authorities has the potential to significantly improve international trade’s efficiency, transparency, and confidence. But there are major institutional obstacles to this change. To successfully integrate blockchain into a field that has historically relied on manual and paper-based procedures, these obstacles—both organizational and technological—must be removed. Initiatives such as PortNet, which is at the forefront of upgrading trade procedures, show that efforts are being made to solve these challenges. Portnet (2023)

Institutional Challenges for Adopting Blockchain

The hefty upfront implementation costs are one of the main obstacles to blockchain adoption in Morocco. Like many organizations in underdeveloped nations, Moroccan customs require specialized solutions that integrate blockchain technology, which necessitates significant expenditures in software and infrastructure. According to the World Bank (2020), these upfront costs can add up, particularly when creating customized platforms that facilitate customs processes like automated invoice verification and real-time tracking. Together with DHL and the German International Cooperation Agency (GIZ Morocco), Moroccan Customs started a project in 2020

to create a blockchain platform that would enhance data exchange amongst all parties engaged in global commerce. Specifically in customs valuation, this program aims to improve risk management and streamline procedures. According to Abdellatif Jouahri, the governor of Bank Al-Maghrib, Morocco is also getting ready to enact legislation governing cryptocurrencies. This would facilitate the management of digital assets and encourage innovation in the financial industry.

Opposition to change is still a major barrier, in addition to financial ones.

Add on, reinforcing customs monitoring mechanisms is essential to improving trade facilitation, as highlighted by evidence from the Busia border case (Kamau *et al.*, 2025). Numerous staff at customs institutions are familiar with conventional procedures, and a transition to blockchain technology may encounter skepticism or resistance. This opposition may be from fear of job displacement, insufficient comprehension of blockchain functionality, or a general reluctance to alter existing operations. According to research by Hajji, Chtaoui, Outmane, Benhrimida, and Zahouani (2024), resistance to technological change in public institutions is common, especially in regions with long-standing bureaucratic practices. If customs officers see a possible decrease in their duties or an increase in the complexity of their workflows, they can be reluctant

to use automated solutions. Addressing this opposition necessitates explicit articulation of the benefits and enduring advantages of blockchain implementation.

A further problem is the necessity for training. Blockchain is a sophisticated technology, necessitating comprehensive training for customs agents and other workers to utilize it proficiently. This encompasses both technical instruction on engaging with the blockchain system and a transformation in mentality to adopt a more transparent and efficient methodology in customs procedures. Morocco's customs authorities must collaborate with educational institutions and blockchain technology specialists to provide extensive training programs for its personnel. Elkoutour, Raji, and Bakhat (2024) assert that training programs are crucial for enabling customs officials to comprehend the potential of blockchain technology and its function in optimizing trade operations. In the absence of such training, even the most advanced blockchain systems may not achieve their maximum potential.

Notwithstanding these problems, Morocco has demonstrated a dedication to enhancing its digital infrastructure. Initiatives like as the PortNet platform have commenced the digitization of trade and customs processes, demonstrating the government's readiness to embrace new technology (Mrabet, 2024). However, for blockchain to be effectively integrated into Moroccan customs processes, it is essential to surmount these institutional obstacles—cost, opposition to change, and the necessity for adequate training.

Training and Capacity Building

A comprehensive training and capacity-building approach is needed to get beyond change aversion and get customs officers ready to deploy blockchain technology. In-depth training programs, conferences, and seminars that explain the advantages and operation of blockchain technology may be part of this, in addition to practical training that helps staff members get acclimated to it.

In order to offer specialized training courses for customs officers and related personnel, the Moroccan government may collaborate with blockchain experts and international organizations. Investing in constant professional development will enhance worker competency and cultivate a culture of innovation within Moroccan norms. A research by Nassar and Kharroubi (2021) identifies the establishment of a robust internal training infrastructure as a crucial component for effective technology adoption in public organizations. This would guarantee that customs officers comprehensively grasp how to leverage blockchain's potential in their daily operations, facilitating a smoother and less disruptive changeover.

International Comparisons and Lessons for Morocco

Customs administrations throughout have progressively embraced blockchain technology to improve transparency, efficiency, and security in trade operations. Global instances of blockchain implementation in customs

might offer significant insights on the application of this technology in Morocco, considering the local context and obstacles.

International Examples of Blockchain Use in Customs

A notable instance is Singapore's TradeTrust project. Initiated by the Singaporean government in collaboration with commercial enterprises, TradeTrust use blockchain technology to digitize trade papers, such as bills of lading and certificates of origin. Singapore has markedly decreased the time and expenses linked to paper-based trade transactions and improved transparency in cross-border commerce by incorporating blockchain into its customs procedures. A study from Song and Tan (2024) indicates that the system has effectively optimized customs clearance processes and decreased the likelihood of fraud and counterfeit papers.

Recent studies indicate that AI-driven fraud detection models outperform traditional monitoring methods by identifying anomalies in real time, reducing opportunities for fraudulent declarations (Serifat *et al.*, 2025).

The Netherlands has used blockchain technology in customs processes, emphasizing the traceability of high-value items such as medications and electronics. The Dutch customs system may utilize blockchain to authenticate trade papers in real-time, therefore eliminating fraud and assuring adherence to international standards. The initiative, launched by Dutch Customs in partnership with IBM, has showcased blockchain's capacity to provide a safe and transparent framework for international commerce, markedly decreasing transaction durations and expenses (Lindner & Puck, 2025).

Applicability to Morocco

Global instances of blockchain implementation at customs provide significant insights for Morocco, especially regarding the enhancement of transparency, mitigation of fraud, and optimization of trade efficiency. The customs agency of Morocco might gain advantages from the digitization of trade papers, shown by Singapore's TradeTrust program.

Given the challenges in combating smuggling and customs fraud, Morocco may learn a lot from the Dutch experience using blockchain technology for traceability and fraud prevention. A similar blockchain-based system may be used by Morocco, a major player in African and Mediterranean trade, to monitor the real-time movement of goods and enhance the monitoring of valuable commodities. Inefficiencies in customs monitoring significantly hinder trade facilitation in African border posts (Kamau *et al.*, 2025). Putting in place such a system might improve Morocco's compliance with global norms and stop the sale of fake goods.

CONCLUSION

Morocco might benefit from seeing how other countries have started using blockchain technology into their customs operations. These stories illustrate the advantages

and challenges of such a shift. By adopting blockchain to validate trade documents, track things in real time, and protect sensitive data, Moroccan customs officers may streamline operations, prevent fraud more effectively, and better adhere to international trade standards. It will take time to make this transition, though. It will necessitate ongoing investments in infrastructure and training, as well as close collaboration between government agencies and commercial parties. If these issues are rectified, Morocco might become a regional leader in the use of blockchain technology to ease commerce, as well as modernize its customs system.

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