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Blockchain as a Method for Reducing Bureaucracy and Fraud in International Trade: A Systematic Literature Review

Project prior to obtaining a Bachelor's Degree in International Studies

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Cuenca – Ecuador

2026

To God, for always being by my side in the face of adversity throughout his journey; to my parents for being my constant support, and, most importantly, to my Moroni for being a silent but unwavering source of strength during the most challenging days.

ACKNOWLEDGEMENTS

First, I would like to deeply thank my parents, Eng. Silvana Bernal and Eng. Ernesto Poma, who have been my unconditional support. To my advisor, Eng. Fernando Lima, for guiding me at every step of the development of this work. Finally, to my closest colleagues and friends for accompanying me throughout this process.

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Abstract

In general, bureaucratic procedures have given rise to various problems, causing delays in the trade of goods in both the public and private sectors. In addition to this, fraudsters seek to gain illegal financial benefits by circumventing the controls carried out on goods entering or leaving a territory. In this context, blockchain is proposed as a solution to counteract these delays, financial losses and fraud. Numerous studies highlight the positive impact of this technology on various processes, building trust through its transparency and by reducing errors related to the integrity of transactions. The aim of this study is to conduct an in-depth analysis of new trends regarding the efficiency of blockchain in reducing such procedures and preventing fraud. To this end, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology will serve as a guide to systematize the evidence from primary studies, systematically identify the methods used, and report findings related to the topic. The main results demonstrate that blockchain enables efficient and transparent operations in international trade; by digitizing procedures, delays caused by paper documents are reduced; in other words, procedures are streamlined and neither institutions nor paperwork become overwhelmed This increases transaction security thanks to the unique identifiers assigned to each transaction, preventing potential fraud, particularly document forgery, false declarations regarding goods, or double spending.

Keywords: Technology, Transparency, Documentation, Security, Automation.

Blockchain como Método para la Reducción de Trámites Burocráticos y Fraudes en el Comercio Internacional: Una Revisión Sistemática de Literatura

Resumen

En general, los trámites burocráticos han tenido diversas problemáticas creando retrasos en procesos de comercio de mercancías, tanto en el sector público como en el privado. En complemento a esto, los fraudes buscan beneficios económicos ilegales sobrepasando los controles que se realizan en la entrada o salida de las mercancías a un territorio. En este contexto, Blockchain se plantea como una solución para contrarrestar estos retrasos, pérdidas económicas y fraudes. Múltiples estudios resaltan un impacto positivo de dicha tecnología en distintos procesos, generando confianza al ser transparente y al reducir errores relacionados a la integridad de las transacciones. El objetivo de este trabajo es analizar profundamente las nuevas tendencias relacionadas a la eficiencia de Blockchain en la reducción de dichos trámites y la evasión de fraudes. Para ello, la metodología PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) servirá como guía para sistematizar la evidencia de los estudios primarios, también identificar sistemáticamente cuáles son los métodos utilizados y reportar los hallazgos relacionados al tema. Los principales resultados demuestran que la Blockchain permite operaciones eficientes y transparentes en el comercio internacional, esto mediante la digitalización de los trámites, se reduce los retrasos de los documentos en papel; es decir, los trámites se agilizan y no se colapsan ni las instituciones ni los papeles. De esta manera se incrementa seguridad en las transacciones debido a las identificaciones únicas de cada una, evitando posibles fraudes, sobre todo la falsificación de documentos, declaraciones falsas de las mercancías o un doble gasto.

Palabras clave: Tecnología, Transparencia, Documentación, Seguridad, Automatización

Blockchain as a Method for Reducing Beurocracy and Fraud in International Trade: A Systematic Literature Review

1. Introduction

In recent years, technological developments have become evident in various parts of the world. Likewise, international trade has evolved at a rapid pace, adapting to the new needs of those involved in such operations; in this context, customs authorities are often mentioned, as they carry put various processes necessary for the entry and exit of goods into and out od different territories (Quispe-Farfán et al., 2021). To this end, there are institutions that act as a regulatory body capable of coordinating all processes, including the World Trade Organization (WTO). Consequently, the process of modernization within these institutions has become essential.

As trade has evolved, several underlying issues have come to light both within and outside the regulatory bodies. The first problem identified since ancient times is bureaucracy, derived from the Latin “bureau” and “krátos”, defined as “desk” and “power” (El Castellano, 2025) to refer those people working behind desks who carry out various administrative tasks (Becerra Paguay et al., 2025). The power vested in certain individual becomes inefficient due to processes involving “bureaucrats”, who are perceived as slow and as causing delays (Espinal-Betanzo, 2022).

Furthermore, shortcomings are found before, during and after the shipment of goods. In this context, commercial fraud stands out; according to Karim & Kudapa (2022), this is described as a deception for profit, leading to a lack of trust between the two or more parties involved int the import or export of goods. This lack of trust is reflected in public institutions and in national and international markets.

Among the types of fraud is fraudulent invoicing, used to falsify prices and declare values that differ from the actual ones (Saavedra & Carvajal, 2022); such falsifications are intended to evade taxes, obtain refunds or reduce interest rates (Jiménez & Podestá, 2009). Evading capital controls to protect assets from economic instability through the unauthorized transfer of foreign currency (Global Financial Integrity, 2022). As well as money laundering, where the origin of goods is obscured to avoid tax and institutional controls (Toondini, 2003).

Finally, there is single bidding, which involves the submission of a single bid in response to a request from an institution company (public or private) (Herrera Vargas, 2024).

At this point, technology presents itself as a solution to such bureaucratic and fraudulent practices. It has emerged to address the various challenges encountered in international trade, such as a lack of trust among stakeholders towards institutions (Tapscott & Tapscott, 2022).

Blockchain is a tool for conducting secure transactions on a global scale, ideal for ensuring transparency and trust. As it is a peer-to-peer technology, the nodes have the ability to review the blocks and the information to verify their immutability; in other words, it operates in a decentralized manner to connect nodes from anywhere without the need for a central server capable of providing access (Varela Pezzano, 2009). The chain operates chronologically, comprising three components: nodes, blocks and a unique identifier called a Hash (Reyna et al., 2018).

Several studies currently address the solution as a positive response to the problem; this focuses on controlling transactions to prevent commercial fraud and, in the same way, to make processes more efficient. Nevertheless, limitations do exist therefore, it is necessary to systematize the existing literature to identify the bureaucratic processes and fraud currently in place and how these can be prevented using blockchain technology. To this end, a guiding research question is proposed:

RQ: How can blockchain technology reduce bureaucratic procedures and prevent fraud in international trade?

1.1 General Objective

To analyze new trends in the efficiency of bureaucratic procedures and fraud control in international trade using blockchain technologies.

1.2 Specific Objectives

The specific objectives are statements that break down the general research objective into detailed and achievable actions.

a) To design a protocol for a systematic literature review to identify the state of art regarding bureaucratic procedures and blockchain solutions.

b) To carry out systematic literature review protocol to identify the main causes of bureaucracy and fraud in foreign trade, with a view to integrating blockchain solutions.
c) To report the findings of the systematic literature review regarding the implementation of blockchain in customs processes to reduce bureaucratic procedures.

This document is structured as follows: Section 2 reviews the literature to establish the theoretical framework and state of the art regarding technological advances in various areas, with a focus on international trade. Consequently, in section 3 PRISMA is proposed as the methodology for conducting the systematic literature review, enabling the investigation and synthesis of the information found regarding the technology and its contribution as a solution to the problem at hand. In section 4, graphs will be used to visualize the results; then, in Section 5, a discussion of the data obtained, along with its interpretation and comparison, is presented. Finally, Section 6 concludes the RSL.

2. Literature Review

2.1 Theorical Framework

According to Tapscott & Tapscott (2022), blockchain aims to build trust in transactions through Smart contracts, enabling secure transactions, particularly on a global scale. This blockchain serves as a tool for automating various processes, acting as a ledger to ensure transparency and prevent duplication. This results in lower administrative costs, a reduction in human error and the decentralization of data; making it accessible to anyone thanks to its nature as a “public network”.

In recent years, the scope of this technology has been re-examined, transforming the digital landscape. This technology offers decentralized solutions, contributing to transparency and the elimination of bureaucratic processes; reducing administrative or logistical costs (Jovanovic et al., 2022). It is known as peer-to-peer, where nodes can act as clients or servers; it can be analyzed as the “new decentralized system”, which involves the networking of computers to utilize the bandwidth of all users currently connected, thereby eliminating the distinction between clients and servers (Varela Pezzano, 2009). Consecuently, it facilitates the storage and sharing of information without the need for a specific server; it prevents total control by a single node; finally, the autonomy of each node becomes evidence in

determining the extent to which it allows other nodes to access its resources (Casino et al., 2019).

Blockchain has three main components. Firstly, there are the nodes: these are responsible for linking one block to another in chronological order, enabling the recording of transactions; then there are the blocks, where transactions are stored, in a sequential manner; finally, there is the unique identifier containing information about the current block and the previous block to which it is linked, known as a "hash". This is how the blockchain is formed; this structure allows all nodes to review and verify transactions.

But how does the blockchain protect itself? Thanks to transparency, which is reflected in the following mechanisms: 1) PoW: Proof of Work, where mathematical problems are solved, a process known as "mining" once the code has been decrypted; a new block can then be added to the chain, which must be verified before others can add it to their local blockchain. Therefore, no block remains "hidden", preventing duplication or misuse within the network. 2) PoS: Proof of Stake, which determines who can validate the blocks. 3) BFT: Byzantine Fault Tolerance, where an agreement is reached between nodes to maintain a margin of error (Reyna et al., 2018).

On the other hand, it is important to mention the different attacks a blockchain faces; the most common within the network is the 51% attack, where the majority band together to control the consensus; that is, they have the full capacity to manipulate the transactions generated through the blocks. However, this issue can go far beyond a single altered block; it involves double- spending, altering the order of the chain, hindering other users' mining activities, and preventing transaction confirmation (Aponte-Novoa et al., 2021).

When dealing with cryptographic mechanisms, complex techniques are required to ensure the accuracy of the data, as well as to monitor its performance and security. This involves two parties: one is a requester responsible for sending the information, and the other is a verifier responsible for validating the information sent. This is where the consensus algorithm (Ferdous et al., 2021) comes in, verifying the data and making it virtually impossible to falsify the blockchain. To this end, three specific types of failure are addressed. Fault failures: these are caused by hardware or software issues and are considered "accidents"- Byzantine faults: these examine the possibility of malicious behavior on the

part of the nodes. And network latency: this refers to the time taken for a transaction to traverse the network (Thakore et al., 2019).

Consensus is fundamental when discussing decentralized systems, as it helps prevent certain attacks within a blockchain. A prime example is the “double-spending” attack, where the same data is “duplicated” and can ed up affecting the rest of the chain if proof-of-work mechanisms, such as consensus, are not carried out. This eliminates the need for a higher authority, such as a “boss”, to approve or reject blocks; instead, the users themselves monitor everything that happens within the chain (Ferdous et al., 2021).

To create a sufficiently “honest” environment, most nodes with truthful messages is required; otherwise, if the majority were malicious nodes, they would enter the chain and alter it. To its end Liu et al. (2022) explain the process by which a block confirms its validity using the following formula: $u = 3f + 1$, where “u” is the total number of nodes required to make a judgment and, within these nodes, “f” are considered malicious. Finally, there is the decision as to whether to add a new block.

Once the basics of the blockchain are understood, we can move on to specific elements. The types of blockchains: public, private, and federated. The first allows anyone to participate as a node and as someone willing to mine the data in exchange for the “reward” found in each block. In the second type, “permissions” are required to operate the blockchain; in theory, this would eliminate the need for PoW, as the data is kept private. The third is a hybrid of the two; the difference lies in the absence of a node, replaced by a “leader” (Casino et al., 2019).

On the other hand, there are bureaucratic procedures; historically, the development of “administration” has been observed through various concepts, including bureaucracy, which derives from the French “bureau” and “krátos”, translated as “office” and “power” or “government” (El Castellano, 2025). Therefore, those with sufficient power to sit behind a desk hold control of the administration, where everyone is assigned a responsibility along with a rank, that is, the hierarchy to which they belong according to their role (Becerra Paguay et al., 2025).

These behaviors can be observed in antiquity, notably in the Ottoman Empire, where children with the capacity to "educate" were placed near administrative centers (Espinal-Betanzo, 2022). The organized system of its officials was termed "civil bureaucracy", in which the sultans ceded their power; this altered the dynamics of centralization, as power was not concentrated absolutely in a central authority (Lope Isla, 2024). Similarly, in ancient Rome, it was known as the "allocation of administrative processes and public works" (Espinal-Betanzo, 2022). Consequently, the process of managing administrative procedures known as bureaucracy" is often perceived as a hindrance and generally refers to state processes involving "bureaucratic" officials (Quispe-Farfán et al., 2021).

When examining the historical development of public administration, one can highlight the modern theory of Max Weber, the sociologist, who was the first to analyze bureaucracy scientifically. Weber proposes the theory of civil servants holding administrative posts, that is, those dedicated to serving the citizens, not the "monarch", to prevent the diversion of public service and thus guarantee order and the efficient enforcement of laws (Weber, 1958). In other words, bureaucracy is not based on the individual who is responsible for complying with the law and never acts entirely autonomously; political associations also play a role (Weber, 1958). Consequently, this can be linked to the *1789 Declaration of the Rights of Man and of the Citizen,* specifically Article 15, which states: "Society has the right to hold any public official to account for their conduct", reinforcing Weber's idea of civil servants working directly with citizens (Asamblea Nacional Constituyente, 1789).

One of the bureaucratic elements found around the world is foreign ministries, which are responsible for maintaining a hierarchical order for the government's representation abroad. The bureaucratic process is understood as the power to make decisions depending on one's position within the organizational chart. In other words, when faced with a situation of greater importance, one must turn to a higher-ranking official for its resolution. However, the purpose of officials within various institutions is called into question, due to the possibility that they may seek personal gain (Lara, 2016).

Today, customs authorities remain part of the government sector; they originated as a necessity to exercise control over goods entering a specific territory (Quispe-Farfán et al., 2021). They are considered essential for determining the duties levied on each item, as well as for registration and collection. The word "custom" derives from the Arabic "ad- dīwān",

which refers to the administrative office designated for such tasks (Basaldúa, 2007). Iti s here that we find several elements of this organization: firstly, the place through which goods pass; secondly, the authority responsible for authorizing passage and collecting duties; and finally, the regulatory framework governing the operation of customs.

Within these processes, the government's role in open integration is of vital importance for the economic links established within a country or region. This enables the facilitation of international trade through customs liberalization and deregulation. This helps them to overcome the limitations of domestic markets and size new opportunities to export their products to other countries (Álvarez, 2020). The revisionist model, being a central pillar of trade liberalization, is driven by its primary objective of establishing a free trade area. From its inception, Mercosur has adapted this model; in other words, social welfare has been considered, leading to the creation of institutions such as the Mercosur Social Institute, whose aim is to "improve the quality of life of the region's inhabits" (Mercosur, 2020). And the anti-systematic model, which emerged as an alternative to the proposed hegemonic integration requires the creation of a new system. An example of this is the Bolivarian Alliance for the Peoples of Our America, announced by Hugo Chávez in 2001, based on the social component (Hernández & Chaudary, 2015).

Therefore, integration seeks to fulfil the objective of promoting an open space for international trade. Such as Free Trade Agreements (FTAs), which throughout history have proven to be fundamental to the "customs union", s was the case with the North American Free Trade Agreement, demonstrating the removal of barriers to international trade between the signatory parties. However, this opens the door to a new analysis of indirect impacts, paving the way for identify the framework offered as a solution for regional integration (Briceño Ruiz, 2013).

2.2 State of Art

The most widely recognized example of blockchain technology, due to its success, is Bitcoin, launched in 2009, which has transformed e-commerce- Although it is not yet in widespread use, it is a clear indicator of the changing ways in which money is currently used. This system is known as peer-to-peer, meaning there is no centralized server; consequently, it can be accessed from anywhere in the world and allows all users to receive, send or verify any transaction in real time. To achieve this, several people known as "bitcoin miners" conduct

the entire verification process in Exchange for bitcoins. However, over the years, this process has become so specialized that it now requires dedicated hardware to mine bitcoins (Robalino, 2016).

This has attracted the attention of companies willing to invest in the creation of specialized systems, as is the case with BITMAIN. It was founded in 2013 and is now a global leader in bitcoin mining servers. Iti s based in Singapore and had branches in Hong Kong, the United States, Malaysia, the United Arab Emirates, Lithuania, and Paraguay. Among its latest projects is the launch of the "ANTMINER" series. Furthermore, the company's president has expressed interest in the implementation of large-scale data centers (Bitmain, 2025). The company demonstrates the potential for industrial and economic development within blockchain technology.

Another significant example, intricately linked to the bureaucratic procedures involved in international trade, is TradeLens, a container tracking platform created by Maersk and IBM. This focuses on reducing delivery times, minimizing costs and risk through the constant monitoring of containers. The solution is divided into three stages: the first is the export of Goods, where a Carrier is responsible for loading the cargo onto pallets and subsequently into containers; the second stage is transport itself, by sea, land or air (TradeLens focuses on sea transport); finally, there is the arrival of the goods, which constitutes the import stage where the containers are inspected and transported to their final destination (Jovanovic et al., 2022).

The key aspect centers on the challenges faced within the supply chain. One of the challenges is the arrival time; this is not known until the goods reach their destination, as confirmed by the authorities or foreign trade operators, and this process can take three to four days; furthermore, it may be delayed by a further day due to administrative procedures; highlighting the third major problem concerning uncertainty when carrying out imports or exports. Four main causes are proposed for this: Firstly, there are individual systems, which in a sense operate in secrecy; that is to say, importers do not openly share information regarding the contents of a container.

For this reason, security procedures are required to prevent smuggling or fraud. Secondly, there is the issue of paperwork, which leads to various administrative procedures and delays;

due to the lack of fully standardized documents, this results in excessive costs and, once again, insecurity. A third cause is the various documents involved in the dispatch and receipt of goods, where the absence of a database prevents this issue from being resolved. A fourth cause is regulations, where once again we face paperwork that delays delivery times, increases costs, and wastes the time of those responsible for foreign trade operations (Jensen et al., 2019).

Finally, a solution developed by TradeLens with the support of IBM, which aims to integrate blockchain technology throughout the entire import process. This involves APIs secure and verify transactions, as well as “smart contracts”, which help automate logistics through agreements between the parties involved. This helps prevent bottlenecks in the entire international trade process. Furthermore, this blockchain can be managed by both the participant and TradeLens itself; in other words, the process is transparent due to the authorization required to access the information, allowing nodes to have security and confidence in the handling of their data. Currently, TradeLens is well-positioned and is therefore capable of facilitation the digitization of supply chain processes, thanks to the support of the maritime carriers (Jensen et al., 2019).

In the government sector, Estonia stands out as a success story for its use of blockchain (among technologies). Completely transformed by technology and recognized by the United Nations as a digital leader in the development of e-government by 2024, it boasts 100% digital administrative procedures, 99,6% of banking transactions carried out digitally, and tax returns completed in just three minutes; all accessible at any time of the day or night (Soares et al., 2023), They do not need to visit government offices in person to carry out administrative procedures (Tapscott & Tapscott, 2022); blockchain, together with other security technologies, enables them to do so from the comfort of their own homes (Paide et al., 2018).

In 2008, “E-Estonia” was launched, whereby all the activities and other government-related tasks became “digital procedures”, giving citizens confidence in the data issued by the government (Mäe, 2017). In other words, nothing conducted via the blockchain should be manipulated or impersonated; therefore, personal data is managed with complete security, such as identification details, which are issued to everyone over the age of 15 (Bekerman & Cresta, 2020).

These digital systems belong to the same digital ecosystem and are referred to as a “Trust Federation” (Parsovs, 2022). This is a key factor in technological advancement worldwide (Hardy, 2024). To this end, other technologies are integrated to detect changes as quickly as possible to prevent attacks and the theft of valuable information, thanks to “Hash” identification (Semenzin et al., 2022). Although hit addresses most of the problems typically faced by governments, such as corruption, bureaucracy, and a lack of public trust, implementing such a system can prove time-consuming and costly for some countries, due to a lack of budgetary planning for its development (Vallner, 2019).

On the other hand, there are Smart Contracts, which stem from the idea of integrating hardware and software to design contracts based on algorithms responsible for creating obligations and enforcing them through algorithms that establish the conditions for the agreement between the parties, ensuring it is fully complied with. Smart Contracts are incorporated digitally and automatically, without the need for intervention, through observability, allowing the main parties to fulfil and demonstrate compliance with the contract; in this way, evidence can be provided to third parties if necessary. Verifiability is also required, whereby the parties may be subject to an audit in the event of non-intentional or whether errors were made in good faith. However, security cannot be overlooked when dealing with confidential documents and information; in other words, no third party should oversee the contract between the main parties, unless the need for an arbitrator arises.

Once it is understood how the contract should function, it is important to set out its applicability and the need to comply with its teams. It is based on an incentive to ensure compliance; therefore, protocols are incorporated, as detailed below. However, it is important to involve a third party who shares an affinity with the parties to function as an arbitrator, helping to resolve any potential issues arising from the execution of the contract. This third party must intervene as little as possible to avoid infringing on the party’s privacy; likewise, they must remain impartial when imposing sanctions if necessary, so that the contract is not breached.

Similarly, a solution must be found to ensure security within contracts, given their very nature of being handled by multiple people. To this end, cryptography is used to encrypt documents, employing two keys: a public key and a private key. The public key is used to

send or receive information without the need to share a single “password”, thereby preventing outsiders from becoming involved or accessing that information. On the other had, the second key allows the individual to create a transaction, which is validated once their identity has been verified (Szabo, 2018).

The use of communication protocol is considered, with three main types standing out: 1) direct communication, where communication takes place directly between both parties. 2) Mediated, which requires a third party or arbitrator in whom both parties place their trust to intervene, if necessary, in a situation where the contract is breached (non-compliance). 3) Adjudicated, where communication, despite being direct between the parties, requires evidence from a third party for the purpose of analysis (Szabo, 2018). However, the Smart Contract goes beyond the relationship between two or more parties, due to its nature of being embedded within the legislation of each country. It goes far beyond mere communication and consensus, which, whilst important when seeking to finalize a contract, brings us back to the basic concept of public and private law; on the one hand, there is everything that is authorized, and on the other, everything that is not explicitly prohibited. This requires a code whose function is to remain vigilant regarding any changes within what is “permitted” and what is “prohibited” (Argelich Comelles, 2020). Similarly, the potential of Smart contracts is demonstrated in various areas, such as finance and law, amongst others, provided they are based on a mutual agreement.

Furthermore, bureaucracy is currently often equated with “inefficiency”, which can be seen as a latent problem in international trade. Specifically, public institutions generally find it quite difficult to implement changes. This is the case in Ecuador, a developing country with a platform called “Ecuapass” Servicio Nacional de Aduana del Ecuador (2024). It latest update has been the implementation of electronic signatures; however, to implement this, each foreign trade operator must submit the following documents: a certificate of the signature registered on Ecuapass, with an application submitted via the Ecuadorian single window, and a certificate confirming that the signature is valid and has not been revoked. Once again, this involves several administrative procedures for a single action. These procedures are set out in the World Customs Organistion’s (WCO) Guidelines on Transparency and Predictability, where parties involved in international trade are once again faced with processes and regulations established to ensure efficiency, transparency and predictability (Aduanas, 2017).

Consequently, fraud is frequently encountered in international trade. In this regard, Karim & Kudapa (2022) describe fraud as deception for the purpose of illegal profit, leading to a lack of trust on the part of the public towards public institutions and markets. One of the most frequently cited examples is fraudulent invoicing, whereby companies commit a serious offence of money laundering by falsifying the prices of goods (Saavedra & Carvajal, 2022). This exchange of incorrect details in international trade. Firstly, there is the evasion of taxes and customs duties, simply by failing to declare the true value of the goods.

Among the reasons is the claiming of tax incentives, which are intended to encourage foreign direct investment and thereby promote exports, aimed at increasing production and generating more employment; in theory, a country would benefit from those individuals, companies or ventures focused on foreign trade. This incentive takes various forms, such as temporary tax exemptions, refunds, credits, financing, and rate reductions (Jiménez & Podestá, 2009). Finally, there is the evasion of capital controls, whereby the capital that a natural person or a company can bring into or withdraw from their economy's id falsified (Global Financial Integrity, 2022).

Another usual form of fraud in trade is money laundering, which is the process of converting illicit money into money that appears to have a lawful origin. To achieve this, the aim is to evade the scrutiny of state and tax authorities. This illicit money is channeled into significant expenditure to avoid detection and into the concealment of funds where spending is minimal and does not arouse any suspicion under the law (Toondini, 2003). In particular, trade opens the door to such deception due to information that is subject to omissions or falsification. These problems stem from inefficiencies in the exchange of information between customs authorities in different countries; furthermore, currency exchange in such fraudulent transactions is a notable factor. Consequently, there is a lag in the systems used for international trade operations and, alongside globalization, significant gaps exist in maintaining transparency (Cortés Castillo, 2015).

Fraud arises because of public and private procurement systems, making the import or export of goods a target for bid rigging. Such actions, apart from constituting illegal activities, promote unfair competition and once again lead to mistrust in the various institutions involved in international trade. Now, part of the fraud faced at an international level involves

tenders manipulated in various ways; among the most common is “single-bidding”, as highlighted in studies on ‘Trade-Based Money Laundering’ (TBML), where only one participant can submit a bid for their goods to become a supplier. Such contracts are often pre-arranged so as not to accept further bids or include deadlines and specifications that are difficult for other bidders to meet. With no other options available, that participating supplier is selected “legally” and is then favored in terms of deadlines, prices and quantities (Titl, 2025).

This process, known as “single bidding”, is one of the red flags that should alert the authorities, due to the anomaly within a system open to all suppliers. It is unusual to see a single bid meeting all the requirements set by the public or private institution(Kang & Miller, 2022). This triggers greater scrutiny; however, it is not the only indicator. Although only a single proposal is submitted, fraud is not evident until the repetition of the same supplier on different occasions is reviewed. It is based on a ‘phantom’ competition due to the publication of a requirement; the institution must select the proposal, which may not be the cheapest but must meet all the requirements. However, it may meet the requirements and be lower in price due to prior negotiation. Among the various requirements are technical excellence, staff qualifications and previous experience (Herrera Vargas, 2024).

However, potential contractors may have a strong interest in accessing information prior to submitting a tender; therefore, this does not necessarily constitute fraudulent negotiation (Titl, 2025). This is necessary to maintain efficient and transparent markets, enabling government administrations to monitor processes, which is key to the agenda of good governance. This system is indispensable and must be supported by a government capable of recognizing the importance of establishing internal policies alongside accountability; this allows for greater control over public and private procurement, preventing corrupt contracts at both national and international levels. To this end, a country’s investment in technology must be considered, as well as its infrastructure and human capital.

Such improvements must be implemented by facilitating the use of various technologies, as these requirements, despite being open, should be accessible to all interested citizens, including at an international level. There should be no technological barrier to the successful implementation of the proposal. To this end, a completely clear legal framework must be

implemented, which is linked to the governance of procurement processes (Khorana et al., 2024).

As can be seen in the World Trade Organization's Agreement on Government Procurement, which comprises 22 parties and covers 49 WTO members, it recognizes the need for a legal framework encompassing various measures relating to the non-discrimination of suppliers, linking this directly to the work involved due to its role as a barrier against potential fraud in international trade. The Agreement emphasizes transparency to prevent conflicts of interest and discourages corrupt practices through impartial procurement; for the same reason, it prohibits compensation from either the contracting authority or the contractor.

However, one of the most important considerations when conducting procurement between countries is the need to pay special attention to developing or least-developed countries. Likewise, tender documents setting out the conditions and procedures relating to the requirements shall be published in such a way as to ensure the dissemination of information and easy access to it; they must include the subject of the contract, the deadline for submission and the address from which the relevant contract documents may be obtained (OMC, 2012).

In turn, customs duty evasion occurs through the falsification of the origin of goods. This is due to discrepancies in documentation aimed at evading import duties or undervaluing exports, which is reflected in taxes such as VAT. In other words, unfair competition arises once again due to the high 'discounts' gained by circumventing the controls to which other importers and exporters are subject. It is important to highlight the danger involved in allowing this type of fraud. On the one hand, there is the 'benefit' for criminals, reflected in lower costs in international trade operations; on the other hand, there is the end consumer. Affecting third parties such as the environment, health or safety, this fraud aims to circumvent non-tariff rules or measures, such as sanitary and phytosanitary standards (Kee & Nicita, 2022).

To this end, the WTO has published rules of origin, which aim to harmonize negotiations between countries specifically to assess whether goods are eligible for preferential tariff treatment. These rules serve several purposes, such as preventing unfair trade through anti-dumping measures; they also aim to protect local industries through safeguards; and rules of

origin are linked to the procurement of goods (government procurement) to balance the balance of payments. This control of origin is essential for the protection of different countries, due to the possible entry of goods subject to sanctions at the destination. Examples are also given of possible fraud to obtain tariff benefits, such as ad valorem rates, where the aim is to alter certain classifications to gain economic benefits (avoiding payment of duties on the total value of goods at customs). Although these rules are strict regarding certificates, a 10% and 15% share of non-originating value is permitted; the preservation of origin is considered within this percentage (OMC, 2013).

To summarize the information, the following types of fraud have been identified: fraudulent invoicing, undervaluation of goods, overvaluation of goods, tax evasion, tax incentives, tax exemptions based on false declarations, financing, access to credit, circumvention of capital controls, money laundering, bid rigging, single-bidding, false origin of goods, and altered tariff classification declarations. It is therefore necessary to undertake a systematic review of the literature on these methods as applied in real life.

3. Methods and Materials

The PRISMA methodology allows for the systematization of information from primary studies, focusing on the structured collection of studies related to Blockchain and bureaucratic procedures as well as frauds. This allows us to observe the current state of the literature to understand the advances in technology and its contribution to imposing barriers to bureaucracy and fraud. In this way, ideas are organized, global frauds are gathered, and a solution is issued, reducing biases. However, it is necessary to take examples to highlight both the successes and the limitations of the technology. Therefore, the research becomes transparent due to the selection of studies, articles, and books, paving the way for a comprehensive and international perspective (Page et al., 2021).

3.1 Objectives

The period analyzed covered studies published from 2008 to the present day. This timeframe was chosen due to the introduction and development of blockchain technology. To address all the necessary areas of knowledge within the analysis of the RSL, it is necessary to formulate research questions. One question addresses bureaucratic procedures to understand the problem at its root; a second question analyses fraud in international trade to propose a solution using blockchain technology; and finally, the capacity of this technology to replace

the human resources responsible for conducting these procedures, thereby avoiding inefficient processes and fraud.

- RQ1: What are the traditional factors in bureaucratic processes?
- RQ2: What are the frauds in international trade and what methods exist for their control?
- RQ3: What are the characteristics of Blockchain as a method for controlling bureaucratic fraud?

3.2 Eligibility criteria

The use of search chains allows for an analysis that does not exclude valuable information but, on the contrary, contributes to knowledge in the various areas concerned (Blockchain technology, foreign trade and bureaucratic procedures). To this end, selection must be based on inclusion and exclusion criteria:

3.2.1 Inclusion Criteria

- Studies presenting information on blockchain technology as a solution across various fields of knowledge.
- Studies addressing issues relating to administrative procedures and fraud in international trade.
- Studies presenting solutions developed in conjunction with blockchain technology to prevent bureaucratic procedures and fraud.

3.2.2 Exclusion Criteria

- Introductory works for special editions, such as books and workshops.
- Duplicate records referring to the same study in different digital libraries.
- Short Works of fewer than five pages.
- Grey literature (without a DOI).
- Literature Reviews.
- Books.
- Book chapters.

3.3 Information Sources

For the Systematic Literature Review, the following digital libraries were considered:

- Scopus
- Web of Science

3.4 Search Strategy

The search string was applied to the two digital libraries selected above, considering the title, year, abstract, and citations. To conduct the search string, we drew on prior knowledge and reviews regarding: Blockchain, Fraud, Bureaucratic Procedures, International, using different combinations of terms to select the best results. The search string is shown on the table below:

Table 1
Search Strings in Academic Databases

Concept	**Sub-String**	**Connector**	**Alternative Terms**
Blockchain in international trade	Blockchain	AND	Types of chains
Fraud and procedures in foreign trade.	Procedures	OR	Fraud
Search String			
Scopus	TITLE ("Blockchain") AND TITLE ("fraud") OR TITLE ("trade") AND PUBYEAR > 2015 AND PUBYEAR < 2026		
Web of Science	Blockchain (Title) and Trade (Topic) and Fraud (Topic) Blockchain (Title) and Trade (Topic) and Fraud (Topic) Trade (Title) and Blockchain and International (Topic)		

Keyword searches were carried out in the relevant digital libraries to identify the literature to be shortlisted for further selection. The selection process will consider both inclusion and exclusion criteria. This literature must address the research questions posed and will be identified using data extraction criteria.

3.5 Selection Process

When identifying relevant studies for the RSL, it is important to take into account the timeframe set for carrying out the search chains. Studies conducted since 2008 are considered, due to the introduction of the technology in 2008, and the timeframe extends to 31 December 2025. Along with the exclusion and inclusion criteria, a database was downloaded from each of the digital libraries for subsequent analysis. Finally, the search strings contain information relating to Blockchain, Solutions, Procedures and Fraud in International Trade.

Once the database has been compiled, a matrix is created in Excel, comprising four stages. The first stage contains the search strings run in Scopus and Web of Science (WoS) along

with their respective results: 410 from Scopus and 200 from WoS, making a total of 610 articles, which will subsequently be screened according to the exclusion and inclusion criteria. Next comes the selection phase for the total of 610 results, during which the following are reviewed: the year of publication, ensuring it falls within the range (1008-2025); the number of pages, ensuring that no literature is less than 5 pages (too short); duplicate entries resulting from the search across two digital libraries; grey literature (without DOI); literature reviews, number of citations and book chapters.

Finally, the titles and abstracts of the articles selected in the initial screening were reviewed to determine which of them were truly relevant to the RSL, and a brief description of each article was provided to identify whether the content was related to the RSL's subject matter.

In the third stage, the articles to be included in the literature review were identified, leading to the fourth stage, which involved the extraction criteria for each article, detailed in Table 3. At this stage, a value of "1" was assigned to articles that mentioned or addressed the research questions, broken down into 11 exclusion criteria. Finally, the findings will be reported quantitatively using the results of the matrix.

Articles per library:

Table 2
Digital Libraries

Digital libraries	Number of articles	Search period
Scopus	410	From: 1/1/2008 To: 31/12/2025
Web of Science	200	From: 1/1/2008 To: 31/12/2025

3.6 Data Elements

To obtain consolidated data from the reviewed articles and a summary of the current state of knowledge, the data extraction criteria for each article must be checked.

Table 3
Research Questions (RQs) and Data Extraction Criteria (DEC)

Research Question	Extraction Criteria (EC)	Options	Objective
RQ1	**EC01:** Types of bureaucratic procedures	In-person, digital, blended	Analysis of procedures delayed due to a lack of efficiency and transparency (Becerra Paguay et al., 2025; Lara, 2016).
	EC02: Limitations in bureaucratic procedures	Inefficiency, document overload	Identification of current issues regarding the inefficiency of procedures (Lara, 2016).
	EC03: Digitalization as a means of reducing procedures	Yes/No	Investigation of viable solutions to the inefficiency of procedures required for commercial transactions (Abbassi & Benlahmer, 2021).
RQ2	**EC04:** Fraud in international trade	Non-existent goods, Documentary fraud, Data tampering, Insurance fraud, Letters of credit, Payment "triangulation"	Review the procedures involved in international trade to identify the most common ones (Saavedra & Carvajal, 2022). This includes money laundering, encompassing the forgery of documents to convert illicit money into a lawful source (Cortés Castillo, 2015).
	EC05: Fraud prevention methods	Pre-shipment inspection, Blockchain, Credit insurance, Due diligence, KYC, (Know Your Client)	Potential fraud is identified from the moment the goods are present before, during and after shipment. With information verifiable through "inspections" (Quan et al., 2025).
	EC06: Blockchain Solutions	Global Shipping Business Network (GSBN), Chainalysis, Polygon ID, Chainlink, TradeLens, Bitcoin.	Case studies demonstrating the efficiency of blockchain solutions in the commercial sector (Tapscott & Tapscott, 2022). To this end, there are further technologies such as Chainlink, which is an interoperability system for communication between chains, facilitating the simplification of international trade through Blockchain and Smart Contracts (Alenezi, 2025).
RQ3	**EC07:** Information Security	Consensus, Supporting technology	Identifying the ways in which blockchain protects itself and transaction data (Banerjee et al., 2018; Jiménez & Podestá, 2009). Preventing the occurrence of duplicate transactions as, since they are visible to all nodes, it becomes almost impossible for everyone to agree to add the same data twice (Aponte-Novoa et al., 2021).
	EC08: Types of blockchain security	Economic, Social/political, Temporal	Blockchain emerges as a secure measure due to three factors: economic, social and temporal Firstly, it is costly to access a blockchain maliciously, due to the hardware and software required to decrypt it (Reyna et al., 2018).

			Secondly, acceptance of the chain depends on industry participation in its implementation; that is, people are directly involved in the implementation and maintenance of the technology (Hyvärinen et al., 2017). Finally, the time taken to attempt to decrypt the chain to alter it (Sant & Tripathi, 2023). Considering the chronology in which blocks are added, each containing the hash of the previous block.
	EC09: Levels f transparency	Public, Mixed (Hybrid), Private, Zero-Knowledge (ZKP)	Identify the diverse types of blockchain to determine the best option for managing international trade procedures (Casino et al., 2019).
	EC10: Consensus mechanisms	Proof of Work (PoW), Proof of Stake (PoS), Proof of Liquidity (PoL), Byzantine Fault Tolerance (BFT), Proof of Authority (PoA), Delegated Proof of Stake (DPoS), Proof of History (PoH)	Analyze how blockchain Works to better understand how data is kept transparent. (Banerjee et al., 2018). Using the various proofs to demonstrate the immutability of data (PoW, PoS, BTF) (Reyna et al., 2018).
	EC011: Advantages of Blockchain in International Trade	Elimination of Document Fraud, Operational Efficiency, End-to-End Traceabilicty, Automation with Smart Contracts	Blockchain does have the capacity to eliminate document fraud due to data integrity (data cannot be easily altered) as well as streamlining operations (in trade); these can be automated through smart contracts (Shamaseen et al., 2025).

3.7 Study of the Risk of Bias Assessment

The results obtained will be interpreted quantitatively, analyzing the years in which they were published, the keywords included to demonstrate their relevance within the RSL, and the number of citations to reflect the document's academic impact.

The aim is to avoid omitting valuable information due to negative results in one or more articles. In other words, all documents containing relevant information and meeting the inclusion criteria set out in the eligibility criteria should be included. To conclude, the Likert scale will be used, which allows for a systematic and comparative evaluation of all selected articles, reviewing not only the positive results but also the limitations faced by both technology and international trade.

To this end, the three research sub-questions outlined previously are taken into account, from which the extraction criteria are derived. The scale is structured as follows:

The study provides relevant information on Blockchain technology and its role in reducing bureaucratic procedures:

1	Contains
0	Does not contain

The study presents relevant information on blockchain technology and its functionality in preventing fraud in international trade:

1	Contains
0	Does not contain

The questions posed are intended to analyze the content of the articles in relation to the extraction criteria set out in Table 3. This coding will enable us to assess the compliance of the selected articles using the matrix explained in the "Selection process".

3.8 Effect Sizes

To report the results obtained from the selected articles using the Excel matrix, percentage figures will be calculated to identify trends or patterns within literature. This allows us to

assess the number of articles addressing each of the previously stated study objectives and questions; the percentages synthesize the information, making it clear, visual, and easy to understand.

3.9 Synthesis Model

In terms of presenting results, bar charts, pie charts, and trend graphs will be used to summarize the information found in the selected articles.

Bar charts are used to display and compare the number of articles by year of publication.

Pie charts will be used to present the results as percentages, showing how the articles in the database are distributed across specific analyzed terms. (Enrique Rendón-Macías et al., 2016)

Finally, line charts will be used to identify trends in the topics covered in the RSL, how many publications there are on blockchain over the years within the study period: 1 January 2008 – 31 December 2025.

4. Results

The results are presented through the process of searching for, selecting, and analyzing articles based on the PRISMA methodology. The findings to be reported focus on the blockchain solution alongside the various supporting technologies; the types of fraud likely to occur during international trade operations; and the inefficiency of administrative procedures (bureaucracy). Based on this, the most frequently recurring ideas within the article search are shown, as well as citations and publications by year. Finally, heatmaps were created to analyze the data presented in the extraction criteria matrix.

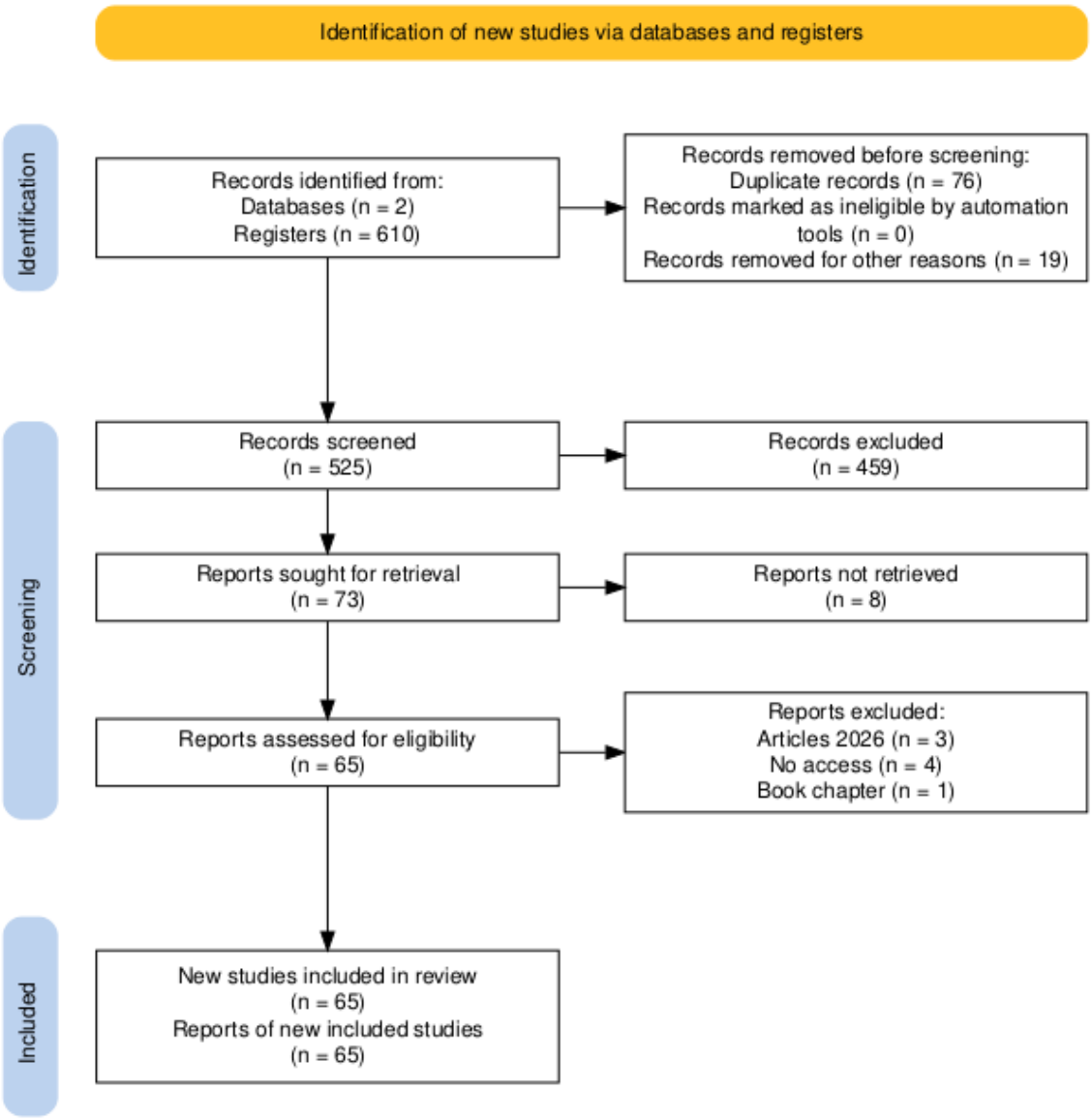
4.1 Study Selection

Based on the search strings applied in the two selected digital libraries—Scopus and WoS—the results are presented in an Excel spreadsheet. The selection process is outlined in the following PRISMA diagram, which shows the four stages: identification, screening, eligibility, and inclusion. In the identification phase, a total of 610 records were found, and 76 duplicate articles and 19 articles shorter than 5 pages were initially excluded. In the screening phase, 525 studies were assessed by reading titles and abstracts; 459 studies were

excluded because their topics were unrelated to RSL and because they were not accessible, as well as studies such as book chapters and other literature reviews.

Subsequently, the remaining 73 articles were analyzed, of which 8 were excluded because 3 were studies outside the search period and 4 were not accessible. Finally, 66 articles were included in the literature review, which will be used to gather information on the use of blockchain technology and bureaucratic procedures, alongside fraud in international trade.

Figure 1
PRISMA Flow Diagram



4.2 Search Characteristics

Figure 2 uses bar charts to illustrate the trend in studies conducted each year regarding blockchain technology; despite the emergence of the technology in 2008, studies are presented up to 2016, which have evolved gradually until 2020, when an increase of 4 articles is observed, and by 2022 a significant rise from 5 to 11 articles published in that year is noted. In 2023, growth continues with 15 articles; conversely, in 2024, the number of publications drops back to 11. Finally, in 2025, there is an increase of 6 articles, bringing the total to 17 publications. The lines show the number of times the selected studies were cited per year, revealing high interest in the early years of 2016 and 2017; however, this declines in 2018 and 2019, with growth resuming from 2020 onwards. This remains stable in the following years and peaks in 2023, representing a greater impact on the subject area.

Figure 2

Number of Records Per Year

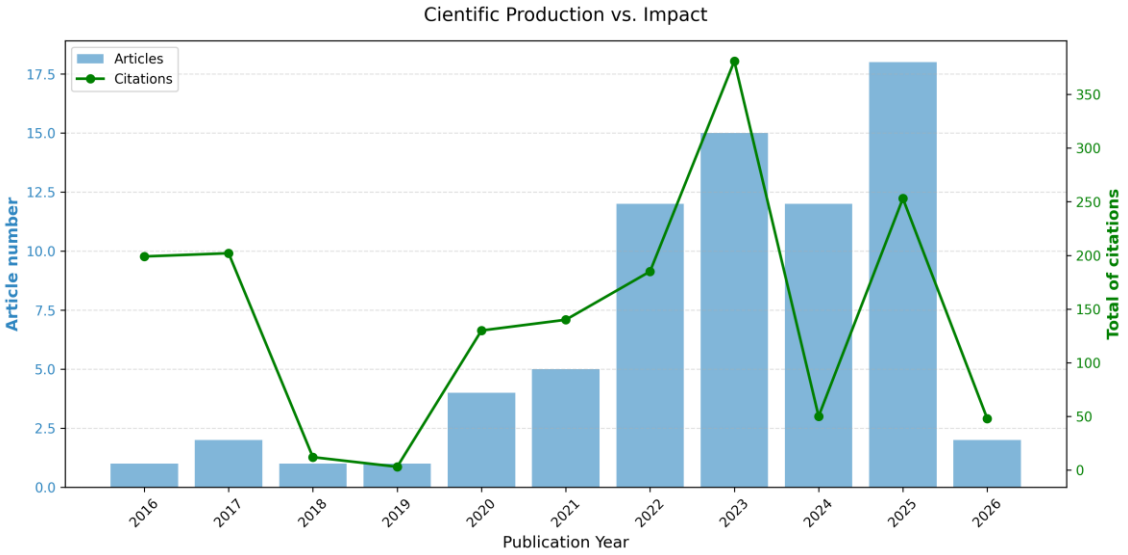


Figure 3 shows the keywords found in the publications selected for inclusion in the RSL; the most frequently occurring terms are ‘technology’, ‘international’ and ‘trade’, highlighting the primary interest in blockchain as a solution to bureaucratic procedures and fraud in international trade.

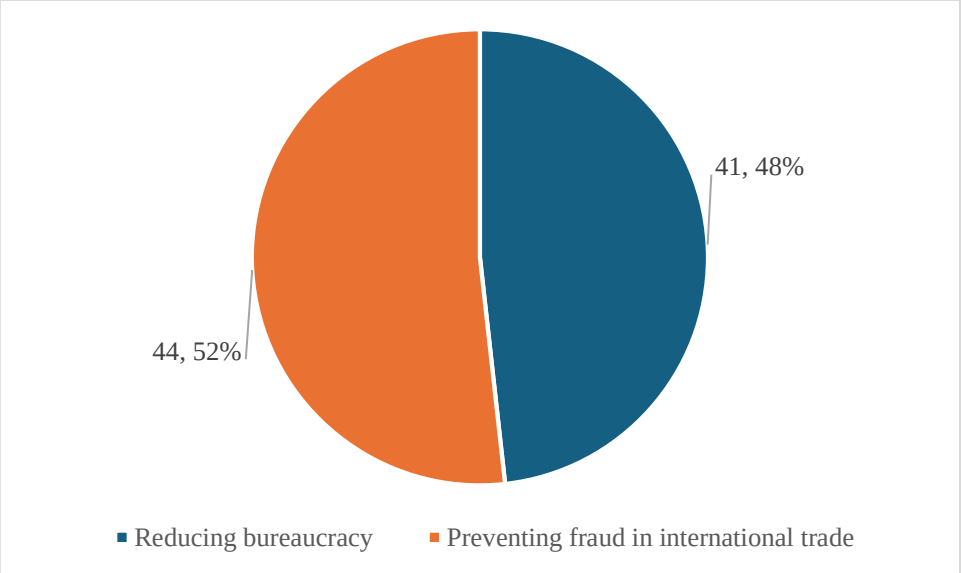
Figure 3
Key Words

4.3 Summary of Study Results in Relation to the Research Questions

4.3.1 Quality of Primary Studies in Relation to the Topic

Figure 4 shows the quality of the studies selected for the RSL, revealing that 44,52% of the studies analyzed present blockchain as a solution for preventing fraud in international trade, whilst 41,8% provide information on the reduction of red tape.

Figure 4
Quality of Studies



4.3.2 RQ1: How can Red Tape be Reduced?

Figure 5 illustrates the advantages of blockchain in international trade in relation to digital, hybrid and in-person administrative procedures, highlighting the types of procedures where

these advantages are most pronounced. Notable among these are the operational efficiency of digital (33) and in-person (26) procedures, as well as the automation of smart contracts (24 and 27), and the elimination of document fraud (25 and 19). This figure demonstrates blockchain technology's capabilities in terms of security and transparency, proving more effective in a digital environment.

Several authors mention the advantages of blockchain in reducing bureaucratic procedures, such as the digitization of bills of lading (BLs), as these are mostly issued on paper; this enhances efficiency, reduces fraud and automates transactions, with a view to reducing manual labor [A001, A048]; this ensures security when making shipments, enabling a transparent process [A009, A030]. As a result, companies are focusing on integrating modern technology to resolve cross-border issues [A039]. This leads to cost reductions through efficiency and data verification, preventing information from being misrepresented [A063, A069].

Figure 5

Blockchain Advantages in Administrative Procedures

Figure 6 illustrates instances of fraud in international trade resulting from existing bureaucratic procedures. Notable examples include document fraud in digital (26) and face-to-face (24) procedures, as well as data tampering in digital (21) and face-to-face (17) procedures; this indicates a high incidence in the digital sphere, highlighting a lack of security, and in the face-to-face sphere, a lack of transparency.

Several authors mention a shift within the economy regarding e-commerce, as paper documents are often difficult to verify, whilst the risk in the digital sphere is that of potential data tampering [A026, A072]. Despite the existence of institutions (customs), there is the problem of paperwork bottlenecks [A034]; in fact, the need for manual verification is what delays procedures, for which reason e-government is proposed to facilitate trade [A041, A052].

Figure 6
Trade Fraud is Due to Bureaucracy Procedures

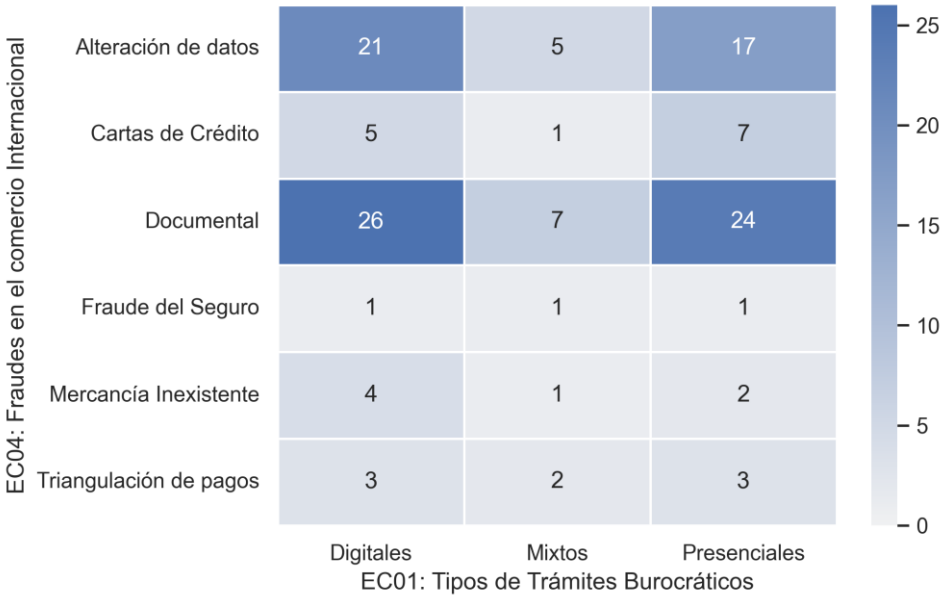
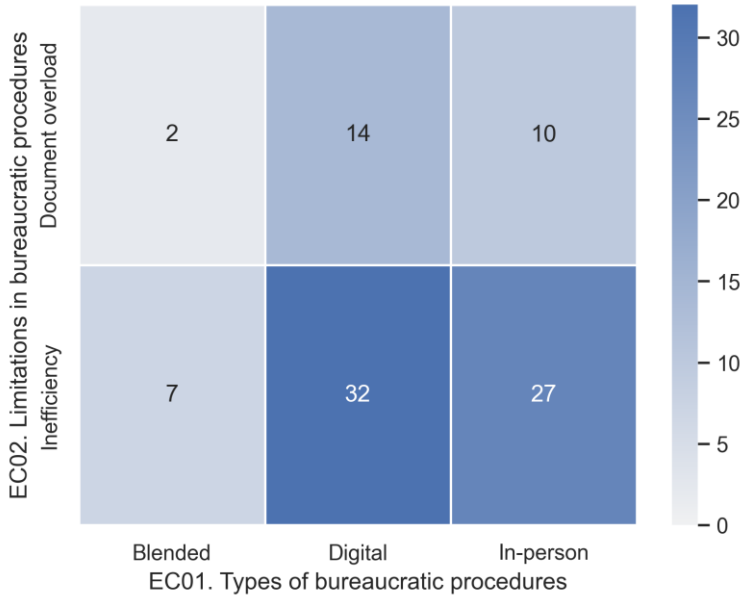


Figure 7 shows the types of bureaucratic procedures and how they affect international trade operations. Inefficiency is highlighted as a result of digital procedures (32) and in-person procedures (27); on the other hand, there is a backlog of documents, with digital procedures being the main cause (14), whilst in-person procedures are not shown to be a major factor (10).

As various authors note, cross-border trade can be characterized as inefficient due to the in-person processes conducted at different institutions, with the aim of reducing time and increasing transparency [A027, A070]. This highlights inefficient data management, both digitally (data alteration) and in person (document-based) [A034]; these traditional methods tend to cause delays; however, without effective digitization, transactions remain stuck in the same cycle that slows down these operations [A039, A064].

Figure 7
Types of Aministrative Procedures



4.3.3 RQ2: How can Fraud in International Trade be Prevented Using Blockchain Technology?

Figure 8 outlines the advantages of blockchain technology in international trade. It illustrates the use of various blockchain solutions such as Bitcoin, demonstrating their operational efficiency (27), automation via smart contracts (26), end-to-end traceability (21) and the elimination of document fraud (15). Alongside these are supporting technologies for automation with smart contracts (19) and operational efficiency (17); however, there is a lower incidence with technologies such as Chainlink, Consensus, Polygon ID, and TradeLens.

In this regard, it is noted that blockchain and verification are factors in building trust within the system and among those involved in international trade; alongside these are contracts designed to satisfy both parties (customer and supplier), enabling automation whilst highlighting the efficient traceability of goods [A015, A019]. The ability to carry out immutable transactions constitutes operational efficiency and, in turn, contributes to transparency and cost reduction [A020, A046]. Furthermore, the solutions verify the legality of goods, as these are vulnerable to fraud [A011]; this enables a competitive advantage to be gained within international trade [A031].

Figure 8

Blockchain Solutions

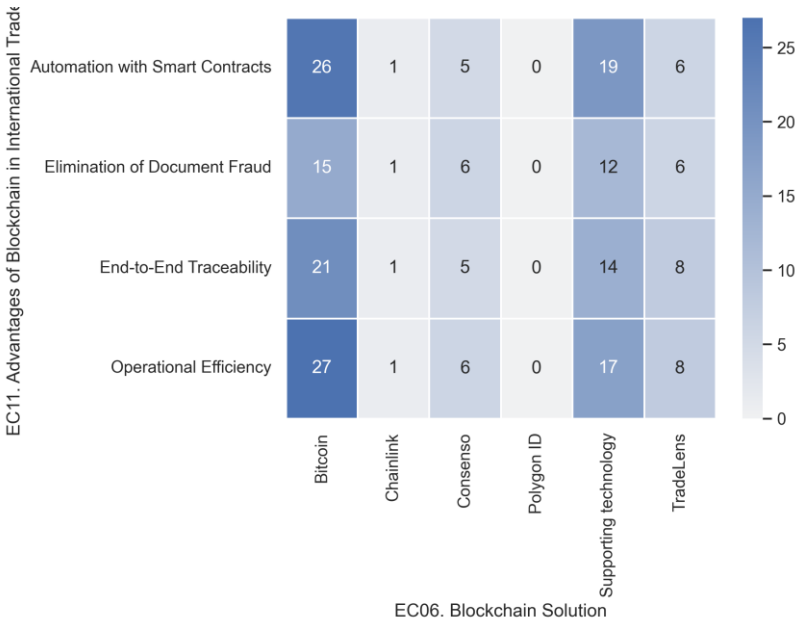


Figure 9 outlines the methods used to prevent fraud in international trade. Blockchain is highlighted for data tampering (37) and document fraud (39); background checks are shown as a means of preventing data tampering (15) and document fraud (17); and finally, KYC (Know Your Client) is noted for the same types of fraud: data tampering (7) and document fraud (10).

As mentioned in various articles, blockchain technology is presented as a secure foundation for preventing malicious transactions [A006], as well as for mitigating operational risks within the supply chain, which arise due to potential data manipulation, directly interfering with security [A010]; such behavior is common in online purchases, with potential token scams; it is therefore not only transactions that are reviewed via the blockchain, but also background checks [A014]. Finally, smart contracts are mentioned as an important part of the automation and mitigation of potential fraud [A047].

Figure 9

Fraud Prevention in International Trade

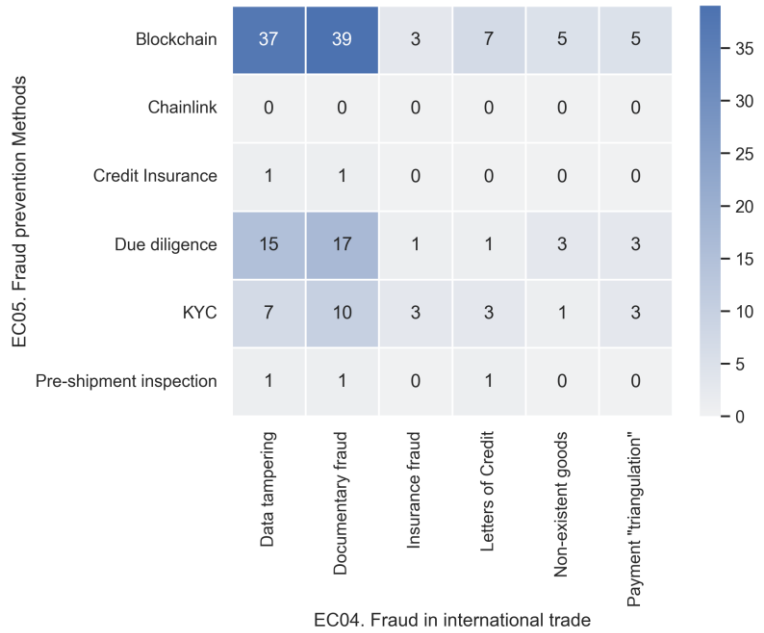


Figure 10 illustrates the transparency of blockchain technology as a method of prevention of fraud. This figure highlights public (29), private (25) and hybrid (17) blockchain technologies, as well as background checks on hybrid (9), public (8) and private (8) chains. This demonstrates that technology can be a positive solution to potential fraud in international trade.

To this end, the authors mention the transparency of public chains due to the visibility afforded to stakeholders; however, private chains are also cited as transparent despite requesting permissions to view transactions based on trust [A012, A016]. In addition to providing transparency to current processes, blockchains focus on the early detection of fraud [A036, A038]; hybrid blockchains emerge as a relationship of trust between nodes that have permission and those responsible for verifying the permissions granted, demonstrating the effectiveness of blockchain and its level of transparency [A071].

Figure 10

Transparency of Technology

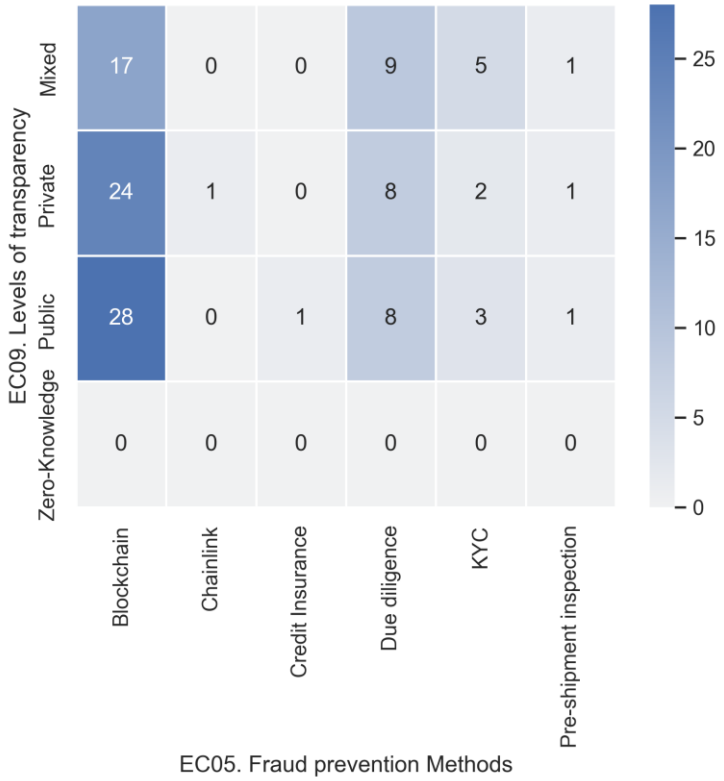
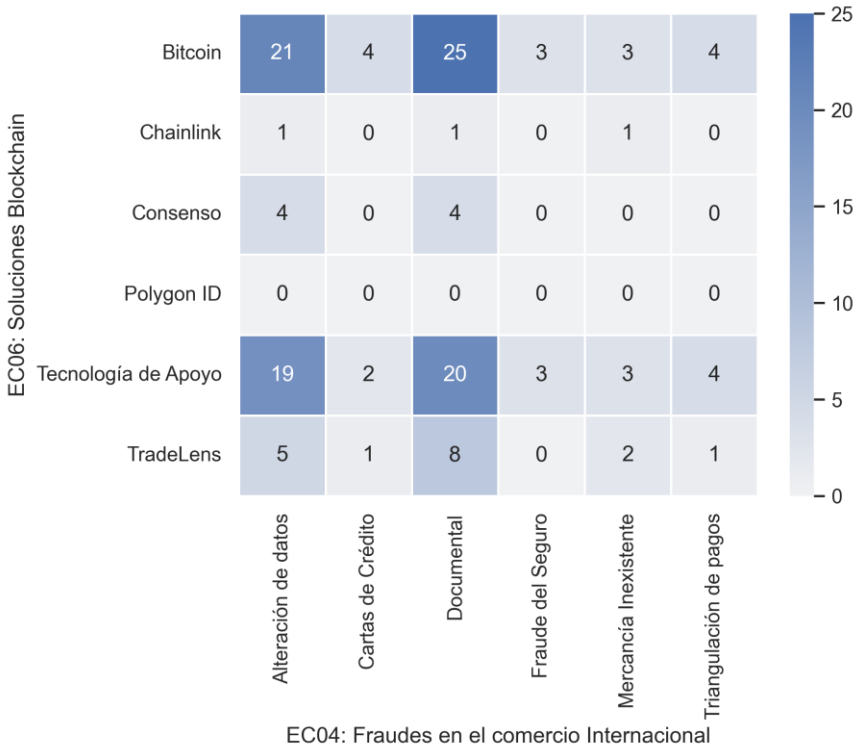


Figure 11 illustrates blockchain solutions designed to combat fraud in international trade. Among these, Bitcoin stands out as a solution for data tampering (21) and document fraud (25); furthermore, supporting technology is presented to prevent document fraud (20) and data tampering (19).

As several authors mention, it is feasible to prevent fraud by detecting unauthorized changes to certificates of origin (data tampering); the vulnerability observed in documentation can lead to forgery, and therefore technology is responsible for providing security [A007, A018]. A clear example is Bitcoin, as it operates with transaction validation, preventing fraud [A017, A021]. Furthermore, TradeLens represents an improvement within the supply chain by digitizing logistics [A013].

Figure 11

Blockchain Solutions for Fraud in International Trade



4.3.4 RQ3: To what extent can it be said that blockchain definitively replaces human staff in preventing fraud and bureaucracy?

Figure 12 illustrates the consensus mechanisms in relation to the transparency of blockchain technology. PoW is prominent in public (11), private (10) and hybrid (10) chains, as is PoS, which is similarly found in public (9), private (6) and hybrid (7) chains; finally, there is BTF, which is prominent in public (8) and private (7) chains.

As the authors mention, consensus mechanisms exist to maintain an environment of trust within chains, both public (emphasizing decentralization) – considering PoS as a probabilistic algorithm capable of aggregating or approving the blocks intended for addition [A056] – and PoW, which is a traditional mechanism in permissioned, public or private chains [A012]. Examples such as Fabric and Ethereum are presented to demonstrate how (enterprise) consortium chains and public chains operate, enabling consensus to function despite potential failures (BTF) [A061].

Figure 12

Consensus and Transparency in Blockchain

Figure 13 illustrates the advantages of blockchain technology in preventing fraud in international trade. It highlights operational efficiency and automation through smart contracts, with scores of 21 and 28 respectively; these advantages are demonstrated in relation to data tampering (31 and 28) and document fraud (33 and 30). Furthermore, the elimination of document fraud and end-to-end traceability demonstrate its applicability in addressing data tampering (28 and 20) and document fraud (26 and 25). Therefore, blockchain proves to be effective in preventing fraud based on information and documentation.

As several authors mention, documents are often difficult to verify; consequently, trade operations are delayed, as is the risk of them being altered in terms of a possible misclassification of goods [A041]. Certificates of origin are also subject to errors, fraud and delays; and letters of credit are susceptible to potential fraud due to their passing through various intermediaries [A052]; To this end, technology reduces time and increases transparency by automating processes [A026]; with smart contracts, the flow of trade can be increased, data manipulation avoided, and product traceability improved [A047, A066].

Figure 13

Blockchain Advantages for Preventing Fraud in International Trade

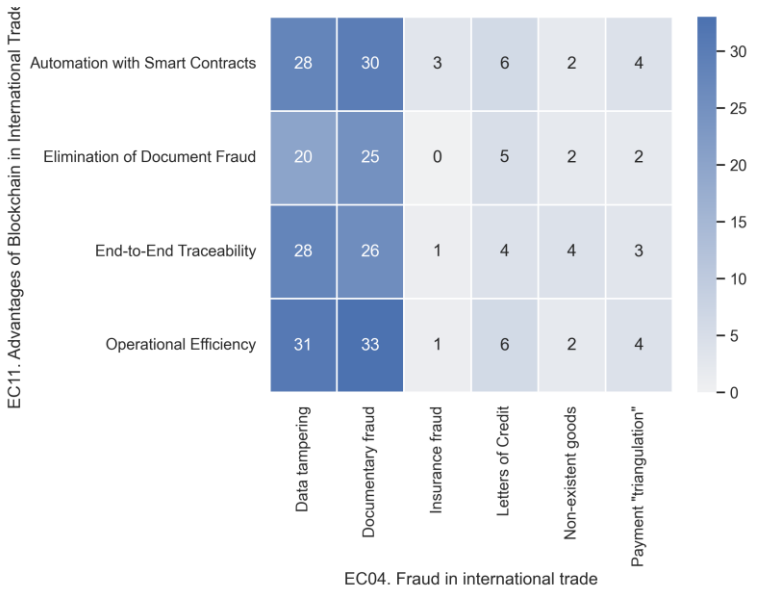
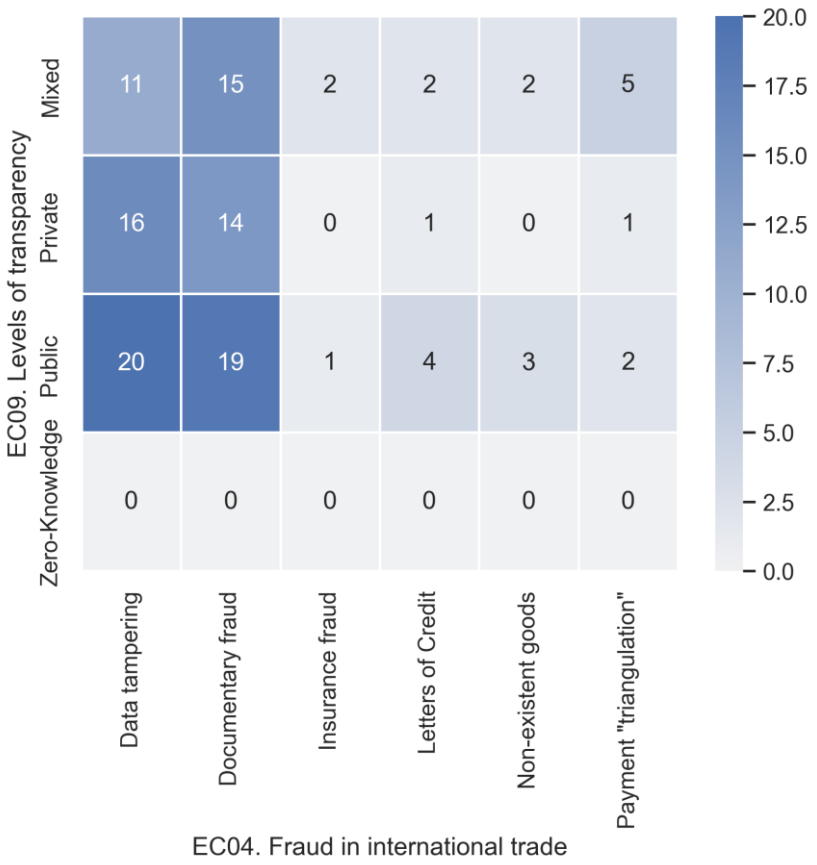


Figure 14 shows the level of transparency in preventing fraud in international trade. The main chain that proves to be effective is the public chain in data tampering (20) and document fraud (19), followed by the private chain in the same categories (16 and 14); finally, the hybrid chain does not stand out, yet it can contribute to transparency in international trade operations (11 and 15)..

To this end, several authors explain the existence of two predominant chains: permissioned and public, enhancing the efficiency of transaction execution simultaneously without centralizing information [A012, A018]; the chains help to avoid the risk of fraudulent transactions such as double-spending or data tampering through their immutable nature [A036, A041].

Figure 14

Transparency in International Trade to Prevent Fraud



4.4 Biases in the Review

Various biases may be present within the RSL; firstly, selection bias, due to the databases used to run the search strings, which limit studies from other sources. Furthermore, a positive bias could be identified in the presentation of the blockchain solution, due to the results; the majority of these indicate effective performance once the technology has been implemented. Similarly, selection bias may arise from documents that are inaccessible within digital libraries. Finally, the evolution of technology may constitute a bias in the systematic review, due to the studies included, which may result in the information contained in those selected studies becoming outdated.

5. Discussion

The results obtained from the analysis of the selected articles, presented as heatmaps, reveal that the benefits of blockchain technology are concentrated in the reduction of red tape and fraud in international trade. These results are consistent with Tapscott & Tapscott (2022), as blockchain is shown to be a transparent solution, building trust among stakeholders in trade;

this scales globally, facilitating cross-border operations and directly addressing international challenges.

Technology enables the reduction of bureaucracy procedures through the digitization of documents, takin into account the immutability of data thanks to consensus algorithms (Ferdous et al., 2021); its potential is highlighted by the decentralized capacity to manage administrative data (Jovanovic et al., 2022). In contrast to the argument put forward by Becerra Paguay et al. (2025), procedures would not be entangled in a vast network of individuals with the power to carry out the various transactions involved in trade, such as the review, authorization and issuance of documents; this process is delayed due to human intervention, as mentioned by Quispe-Farfán et al. (2021).

When it comes to institutions, customs authorities emerge as a necessity within society, serving to control the movement of goods within a territory. In other words, the procedures involved in carrying out control processes regarding the release and authorization of goods, the collection of duties, inspections to secure goods, and security measures to prevent smuggling become inefficient due to a lack of standardization, which prevents a reduction in time and costs (Jensen et al., 2019). Therefore, it is important to utilize blockchain technology to carry out this process effectively; as shown in the results, it is possible to replace in-person and digital procedures with automated and decentralized processes. Among these are Smart Contracts, which are responsible for initiating and finalizing agreements in accordance with pre-established conditions, thereby preventing delays when accepting of prohibiting the entry or exit of goods (Szabo, 2018).

Similarly, the advantage in terms of fraud prevention is evidence due to the immutability of transactions; that is, a recorded transaction cannot be altered without being detected by all nodes (Casino et al., 2019). Among the types of fraud that are prevented is double spending, as the blockchain does not allow a block to be maliciously used twice. In other words, an invoice cannot be used at two different financial institutions; if a solution different from the traditional one were proposed, the institutions would be connected via this shared ledger (Ferdous et al., 2021).

Furthermore, paper documents including Bills of Landing (BLs), certificates of origin and invoices are replaced by non-fungible tokens (NFTs) designed to guarantee the accuracy of

the information. This prevents fraud such as fraudulent invoicing where goods are undervalued or overvalued, and false declarations (Kee & Nicita, 2022). Among the benefits identified is the transparency of technology, with help combat money laundering in trade due to the traceability of the supply chain (Reyna et al., 2018). No transaction is independent: therefore, a record of each one is stored in the hash, enabling inconsistencies to be identified.

Overall, the results demonstrate the technology's ability to reduce the need for human staff, thereby cutting red tape and preventing fraud; this is achieved by eliminating intermediaries through a decentralized peer-to-peer architecture, which enables suppliers and customers to connect directly (Varela Pezzano, 2009). However, it would not replace them entirely, due to the need for supervision of tasks, as well as the governance and design of the standards and conditions on which operations will be based before they can function autonomously.

6. Conclusions

The most significant finding is the efficiency of blockchain in eliminating red tape through the digitization of processes; it is also effective in preventing fraud in international trade due to its operational efficiency. This helps to increase the confidence of individuals and organizations due to the transparency with which it operates, enabling data verification without the need for an intermediary, avoiding delays and reducing costs when carrying out various trade operations.

International trade is negatively affected by inefficient institutions, along with the people working within them. These processes are the main factors delaying trade operations, creating a barrier to trade facilitation. Furthermore, they present opportunities for malicious individuals seeking to manipulate information to gain financial benefits illegally; this leads to a lack of trust among foreign trade operators, as well as customers and suppliers.

Given the evolution of various technologies alongside trade, it is necessary to implement an efficient solution to avoid potential delays caused by the centralization of the systems and institutions involved in transactions. Within this centralized data framework, intermediaries are involved; consequently, it is not possible. This directly affects transaction costs, with goods spending more time at customs and in warehouses, amongst other factors. It also risks the alteration of data recorded in documents such as commercial invoices, bills of landing, certificates of origin and custom declarations, among others.

Blockchain therefore emerges as a solution because it maintains data security and transparency, and features consensus mechanisms, which help eliminate fraud and increase operational efficiency; this means that Blockchain makes a positive contribution to international trade, as demonstrated in various areas. Firstly, security is a key feature due to the encrypted information within each block, with no possibility of drastic changes going unnoticed by the other nodes; consequently, transparency is built in to ensure step-by-step traceability. This paves the way for cost reductions in areas such as intermediaries (human resources), paperwork (duplication of documents) and procedures (in-person, digital or hybrid) that take up everyone's time.

However, it cannot be said that blockchain operates in isolation within the various processes; that is to say, its efficiency can be enhanced through supporting technologies, such as IoT for identifying transactions with inconsistencies, the detection of which is necessary to prevent any fraud within trade. Similarly, smart contracts contribute to the automation of processes and reduce the time taken to carry out activities.

Based on the detailed results, there is a need to develop Blockchain prototypes in developing countries to reduce bureaucratic procedures and prevent fraud in international trade; this would reduce staffing costs and the costs associated with a system that delays various transactions. A possible analysis is proposed to identify ways of digitizing customs processes and legalizing the use of the new technology to carry out foreign trade operations efficiently This is accompanied by a review of the environment, determining whether blockchain is an indispensable solution or step towards eliminating intermediaries to enable efficient, agile and transparent transactions.

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8. Appendix

Appendix 1

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