PEOLPLE'S DEMOCRARTIC REPUBLIC OF ALGERIA
MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH
MOHAMED KHEIDER UNIVERSITY OF BISKRA
FACULTY OF ECONOMICS, COMMERCE AND MANAGEMENT SCIENCES
DEPARTMENT OF COMMERCE SCIENCES

Thesis Title

The role of blockchain technology in improving customs procedures

Study case of : European Union, Turkey

A *Thesis* Submitted to the Department of Commerce Sciences as Partial Fulfilment for the Master's Degree in Commerce Sciences. Option; Finance and international Trade

Submitted by: Lyna Debza **Supervised by:** Dr. Farid Ben Abid

Farid Benabid	Lecturer Class "A"	University of Biskra	Supervisor
Abd Elhak Rais	Professor	University of Biskra	Chair
Kamelia Yezghech	Professor	University of Biskra	Examiner

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بِسْمِ اللَّـهِ الرَّحْمَـٰنِ الرَّحِيمِ

{رَبِّ اشْرَحْ لِي صَدْرِي* وَيَسِّرْ لِي أَمْرِي* وَاحْلُلْ عُقْدَةً مِّن لِّسَانِي * يَفْقَهُوا قَوْلِي}

سورة طه، الآيات: 25-28

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To everyone mentioned above, and to countless others who have played a part in my journey, thank you for your love, prayers, and encouragement. May our bonds of love and friendship continue to grow stronger with time.

Abstract

Blockchain technology is one of the recent developments that can offer significant benefits to customs services by simplifying procedures and enhancing transparency and security. This research aims to explore how customs services in the European Union and Turkey can be improved through the implementation of blockchain technology. This study investigates the potential impact of blockchain on customs procedures, trade facilitation, and regulatory compliance.The reaseche approach adopted in this reaserche includes a review of relevant literture and the implementation of practical reaserche , the latter was caried out through a case study ith European Union and Turkey using descreptive analytical method.The findings highlight the potential of blockchain to streamline customs processes, reduce delays, combat fraud, and improve overall efficiency in cross-border trade. The study also discusses challenges and opportunities associated with the adoption of blockchain in customs services and provides recommendations for policymakers and stakeholders to leverage this technology effectively.

Key Words : Blockchain technology, customs services, European Union,Turkey, Transparency .

ملخص

تعتبر تقنية البلوكشين واحدة من التطورات الحديثة التي يمكن أن تقدم فوائد كبيرة لخدمات الجمارك من خلال تبسيط الإجراءات وتعزيز الشفافية والأمان. تهدف هذه الدراسة إلى استكشاف كيفية تحسين خدمات الجمارك في الاتحاد الأوروبي وتركيا من خلال تطبيق تقنية البلوكشين. تقوم هذه الدراسة بتحقيق الأثر المحتمل لتقنية البلوكشين على الإجراءات الجمركية وتسهيل التجارة والامتثال التنظيمي. يشمل النهج البحثي المعتمد في هذه الدراسة استعراضاً للمراجع الأدبية ذات الصلة وتنفيذ بحث عملي، تم تنفيذه من خلال دراسة حالة مع الاتحاد الأوروبي وتركيا باستخدام أسلوب تحليلي وصفي. تسلط النتائج الضوء على إمكانية تقنية البلوكشين لتبسيط عمليات الجمارك، وتقليل التأخير، ومكافحة الاحتيال، وتحسين الكفاءة العامة في التجارة عبر الحدود. كما تناقش الدراسة التحديات والفرص المرتبطة بتبني تقنية البلوكشين في خدمات الجمارك وتقدم توصيات للمصنعي السياسات والأطراف المعنية للاستفادة من هذه التقنية بشكل فعال.

الكلمات المفتاحية. تقنية البلوكتشين، خدمات الجمارك، الاتحاد الأوروبي، تركيا، الشفافية .

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THE GENERAL FRAMEWORK OF THE STUDY

Introduction:

To keep pace with global economic transformations; The Customs Administration has undertaken a set of administrative reforms aimed at adding transparency and combating bureaucracy. This is by adopting a new information system that is in line with current technological development in order to upgrade and improve the performance of its services. Mainstreaming electronic data interchange; Applying electronic services at all stages of customs to facilitate and simplify procedures and bring them closer to those dealing with them, especially foreign investors, with the aim of contributing to the development of the national economy and reviving foreign investment. There are platforms that have emerged to improve and develop the work of customs administration, and among these platforms is: Blockchain platform which could help to simplify the customs process by providing a secure, transparent and efficient way of managing data.

Research Problem:

Based on the above, the problem of the study is determined by the following question

How does the blockchain platform or technology contribute to improving and facilitating customs clearance?

The following sub-questions arise

Q1-1 What is blockchain technology and how does it work ?

Q1-2 What are The advantages of using blockchain technology in the customs activities ?

Q1-3 What was the experience of Tukey and the European Union with the blockchain platform and customs?

Hypothesis of the study:

In order to provide an appropriate answer to the questions posed and the study seeks to test the validity of the following assumptions:

Ho1-Blockchain technology can help increase the security of customs operations and procedures.

Ho2- blockchain could help to reduce costs associated with customs processes

and procedures

Ho3- The adoption of blockchain technology in custom services will not enhance or ease customs transactions between the European Union countries and Turkey.

The Significance of the study:

- The purpose of this research is to explore the potential of blockchain technology to address customs sevices challenges
- This study focuses on how can blockchain impoves custom sevices and how to make it easier for customs agencies

The Objectives of the study:

- Assessing the benefits and challenges of implementing blockchain technology in custom services

- Examining the factors that influence the successful adoption of blockchain technology in custom services

- identifiyng blockchain technology and custom services

Literature Reviews:

1. **Blockchain in Agriculture supply chain management Case study IBM Food Trust by Baliouz Nadia Lamis 2022/2023 :**

This paper focuses on the IBM Food Trust blockchain platform and explores the application of blockchain technology in agricultural supply chain management. This study examines the potential benefits of blockchain in increasing transparency, traceability and accountability in agribusiness. Through a literature review, case analysis, and research methodology, this study confirms that blockchain can improve supply chain transparency and traceability. Although the IBM Food Trust platform has significant advantages, implementation challenges remain. This research contributes to knowledge acquisition by proposing a framework for blockchain adoption and recommending future research on scalability and integration with emerging technologies.

2. **Blockchain Technology and Customs Procedures By Mihaela Gabriela Belu 2020 :**

This study present the advantages of implementing blockchain technology in international commercial transactions, in general, and in carrying out customs clearance activities, in particular. If we refer to the customs clearance of goods, the use of blockchain has a number of advantages, such as: completion of customs clearance formalities in a much shorter time; customs risk management; real-time verification of goods – quantitative, qualitative, of their

origin. Nowadays, global supply chains face many challenges posed by the health crisis. The implementation of new technologies, especially blockchain technology, facilitates the tracking of events and the investigation of possible incidents, the settlement of disputes, ensuring the integrity of the cargo, the trust of the parties involved in the process, digitization.

3. **Is blockchain technology a silver bullet for a customs environment? By Hüseyin Yaren 2020 :**

This paper focuses on how blockchain technology's implementation may have possible drawbacks in a customs environment. To argue this, blockchain technology and its features are summarised, then three indicators of customs duties (tariff classification, origin and value) and several case studies are used to illustrate these drawbacks .

4. **The role of blockchain technology in facilitates international trade By Guechari Yasmina 2013 :**

This study aims to show how blockchain facilitates and improves the international trade mechanism, especially how this technology can improve trade finance and facilitate document management and logistics. The findings of this study indicate that the application of blockchain in international trade would lead to: connecting all parties in a single and private network, enabling real time tracking of documents and the electronic transfer of the required documents as well as eliminating the need for an intermediary; All this improves payment system procedures (reduces transaction fees and the delays in time settlement and delivery time), reduces the amount of physical documentation to manage and leads to faster, cheaper and secured logistics operations, as confirmed by TradeLens experience.

CHAPTER ONE : ***Blockchain and Customs Conceptual Framework***

Preamble

In today's global economy, international trade faces challenges due to complex regulations and bureaucratic procedures. Blockchain technology offers a promising solution by providing a decentralized and tamper-resistant digital ledger. In customs operations, blockchain can enhance transparency, reduce paperwork, mitigate fraud, and expedite the movement of goods across borders. This summary introduces the transformative potential of blockchain in customs operations for facilitating smoother, more efficient, and transparent international trade.

Topic one :Introduction to blockchain

1. The history and concept of blockchain

Blockchain operates as a decentralized system, fulfilling the dual role of recording and storing transaction records. Within this blockchain framework, data resides among a network of personal computers referred to as "nodes," absent of any central authority. Each transaction or alteration of data triggers immediate updates across the network, ensuring uniformity among all nodes. Consequently, identical information is stored within each node, and this data permanence feature prohibits any deletion or modification. (Baliouz, 2023)

Blockchain technology embodies transparency and autonomy, presenting the potential to enhance numerous domains through shared data among all participants. It serves as a platform for establishing immutable, secure, and transactionally distributed databases, employing cryptographic algorithms to authenticate transactions. This cryptographic validation supplants the need for a "third-party trust" mechanism, allowing two parties to authorize online transactions through digital signatures. For instance, centralized healthcare systems encounter various drawbacks such as information misuse, data volatility, high costs, sluggishness, lack of transparency, and inefficiency. However, integrating blockchain into healthcare promises improved interoperability, immutability, heightened security, transparency, reduced costs, and expedited care. (Carmen Holotescu, 2018)

Blockchain technology has emerged as a pivotal technological advancement, recognized not merely as a database, but also as a cornerstone of digital trust. Coined by David Chaum in 1982, the term "blockchain" gained further traction through the explorations of Stuart Haber and W. Scott Stornetta in 1992. It was with the advent of Satoshi Nakamoto's implementation post the introduction of the inaugural cryptocurrency, Bitcoin, that blockchain technology truly came into focus. Since then, a plethora of tools, technologies, concepts, and protocols related to blockchain have proliferated. Initially employed in the mining of cryptocurrencies like Bitcoin, blockchains boast immutability and resilience to alteration, owing to the distributed storage of transactions across various nodes within a computer network. The versatility and significance of blockchain technology span across diverse fields, owing to its inherent features and services. (Baliouz, 2023)

Term	Meaning
Blockchain	The main authentic ledger
Blockchain technology	The technology involved in simulating the overall architecture of the blockchain
Blockchain network	A network in which the blockchain exists
Blockchain generation	A particular blockchain
Blockchain user	A person, institution, organization, business, department, or government who is a part of the blockchain network

Table 1 : Blockchain terminology
Source (pardalos, 2021)

2. The mechanisme of blockchain

When a user enters a blockchain network and initiates a transaction, it gets disseminated across the peer-to-peer (P2P) network. Nodes within the network, representing users, validate the transaction using a consensus mechanism like proof of work (PoW) or proof of stake (PoS). Once verified, the transaction is added to a block. Block inclusion requests are then submitted to the chain after assembling the necessary transactions. Prior to incorporating a block into the chain, blockchain miners scrutinize it for validation to prevent any data alteration or tampering. Validated blocks are appended to the main chain, while invalid ones are rejected and excluded. Following this process, the transaction concludes, and the transaction history becomes immutable, impervious to alteration.

(pardalos, 2021)

Figue 1 : The working mechanism of a blockchain Source

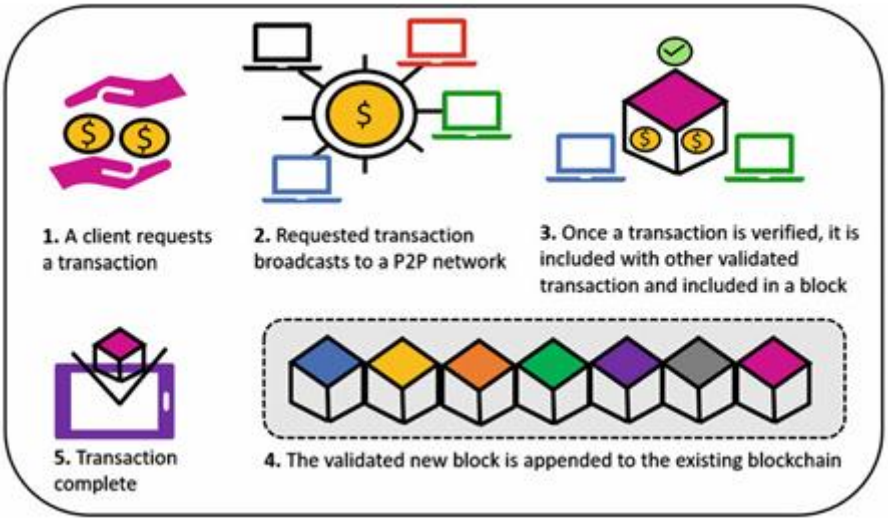

Figure 2 : The sequence of the blocks in the blockchain

3. Blockchain characteristics

In this section, we outline the essential attributes of blockchain and explain how these traits significantly enhance a system. The integration of all these key features sets blockchain apart from traditional methods.

Decentralization

In the conventional centralized approach, each transaction undergoes validation by a central entity, resulting in performance bottlenecks and additional costs. However, within a blockchain system, transactions are authenticated peer-to-peer, eliminating the need for a central authority. Consequently, development, maintenance, and operational expenses are notably reduced, while server performance bottlenecks are alleviated. (Okazaki, 2018)

Immutability

Valid transactions become part of a block, and the revised ledger is propagated across the blockchain network. Due to the cryptographic nature of blockchain technology, even minor alterations or tampering with information become infeasible. Any modification to data within a block alters the hash values, ultimately disrupting the chain. Consequently, tampered blocks fail validation, and any attempt at falsification is promptly identified. (pardalos, 2021)

Anonymity

Within a blockchain network, no central authority exists to retain users' private information. Consequently, participants in the blockchain network are not required to divulge their identities to any third party. Instead, each user engages with other blockchain clients by creating one or more addresses, which serve as identifiers during communication, transactions, or contract signings. By safeguarding the private information of users and avoiding identity disclosure, this approach ensures privacy preservation. (pardalos, 2021)

Auditability

Every block includes a timestamp field to record its creation time, while each transaction within a block also carries its own timestamp denoting when it was processed. Additionally, any alteration to transaction or block details can be readily detected by other nodes in the network. By recursively tracing back through the chain using previous information hashes,

users can examine past records stored across nodes in the distributed system. This iterative process enhances blockchain transparency, thereby bolstering its auditability feature.

Non-repudiation

Non-repudiation is another essential characteristic of blockchain, ensuring that none of the participants can deny the existence or behavior of a transaction event. The main objective of non-repudiation is to gather, store, maintain, provide, and verify indisputable evidence regarding messages exchanged among blockchain participants. Non-repudiation applies in two key aspects:

(1) a sender "Bob" sends a message to a receiver "Alice." "Bob" cannot decline the action.

(2) Similarly, "Alice" cannot deny that he did not receive that message.

Blockchain uses asymmetric encryption, e.g., digital signatures, to assure the non-repudiation feature. (pardalos, 2021)

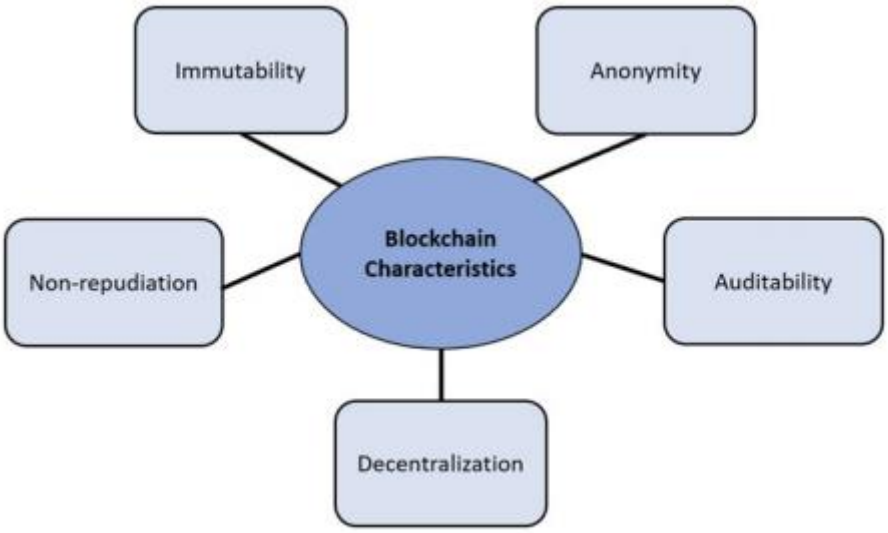

Figure 3 : Blockchain characteristics

4. Blockchain types

Based on the nature of data accessibility Blockchain can be categories as below
1. Public Blockchain: In this variant of Blockchain, transactions are open to anyone for reading and submission.
2. Private Blockchain: In this category of Blockchain, only one organization or all its subsidiary organizations within the same group are granted permission to both read from and submit transactions to the network.
3. Community/Consortium Blockchain: In this variant of Blockchain, numerous groups of organizations collaborate to form a consortium, granting them the capability to both submit transactions and access transactional data.
4. Hybrid Blockchain: - This is new category where any of three Public, Private or Community/Consortium, Blockchain can be combined to facilitate transactions. A Blockchain platform can be configured in multi-mode using Hybrid Blockchain.

Based on the need of authorization to participate in Blockchain it can be categories as below

1. Permission less Blockchain: Participation in this type of Blockchain doesn't require prior authorization; anyone can engage in the verification process and join the Blockchain network using their own computational power.
2. Permissioned Blockchain: Permission is required to join this type of Blockchain. Only authorized parties have the privilege to operate nodes for verifying transactions within the Blockchain network.
3. Hybrid Blockchain: There is a possibility that a node may simultaneously participate in both Permissionless and Permissioned Blockchains to enable inter-Blockchain communication. This type of Blockchain is referred to as a Hybrid Blockchain. Additionally, a Blockchain platform can be configured to support either or both Permissioned and Permissionless models.

As far as core functionality and smart contract support in concern, Blockchain can be categories

1. Stateless Blockchain: In a Stateless Blockchain system, the primary focus is on optimizing transactions and chain functionality, specifically verifying transactions through hash computation. This system operates independently of the smart contract logic layer, thereby remaining unaffected by any bugs or vulnerabilities present in smart contract code.
2. Stateful Blockchain: This variant of Blockchain offers optimization not only for smart contract logic but also for transaction computing capabilities. (Shrivas & Yeboah, 2019)

blockchain can be categorized into three novel types based on their overall system and applications; a comparison was also made between these different types.

.1 Only cryptocurrency blockchain (C2C)

This category is exclusively dedicated to cryptocurrency chains, focusing entirely on decentralizing money or payments. Bitcoin, introduced in 2009, stands as the most prominent cryptocurrency within this domain. It represents the inaugural implementation of Distributed Ledger Technology (DLT) and supports Bitcoin mining. The primary objective behind the development of the Bitcoin blockchain was to resolve the challenge of double-spending digital currency. Within the Bitcoin network, two types of nodes exist: users who initiate transactions and miners who vie to append new blocks to the primary blockchain. It's worth noting that besides Bitcoin, numerous other cryptocurrencies operate within this type of blockchain. (Sana Sabah Sabry, 2019)

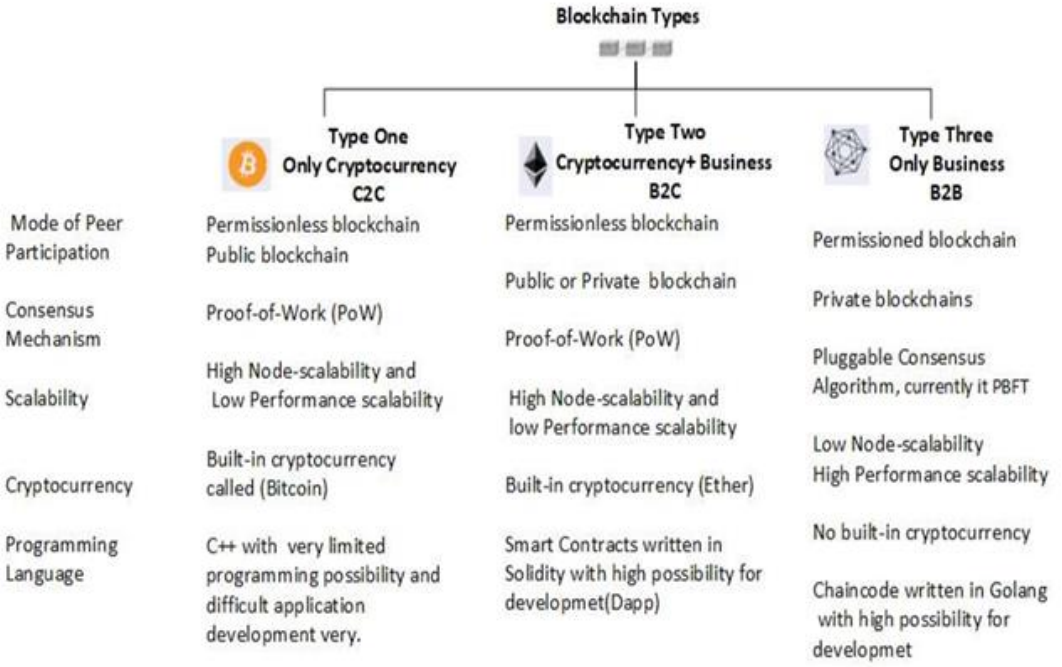

Figure 4 :Blockchain types

Eample of bitcoin transaction

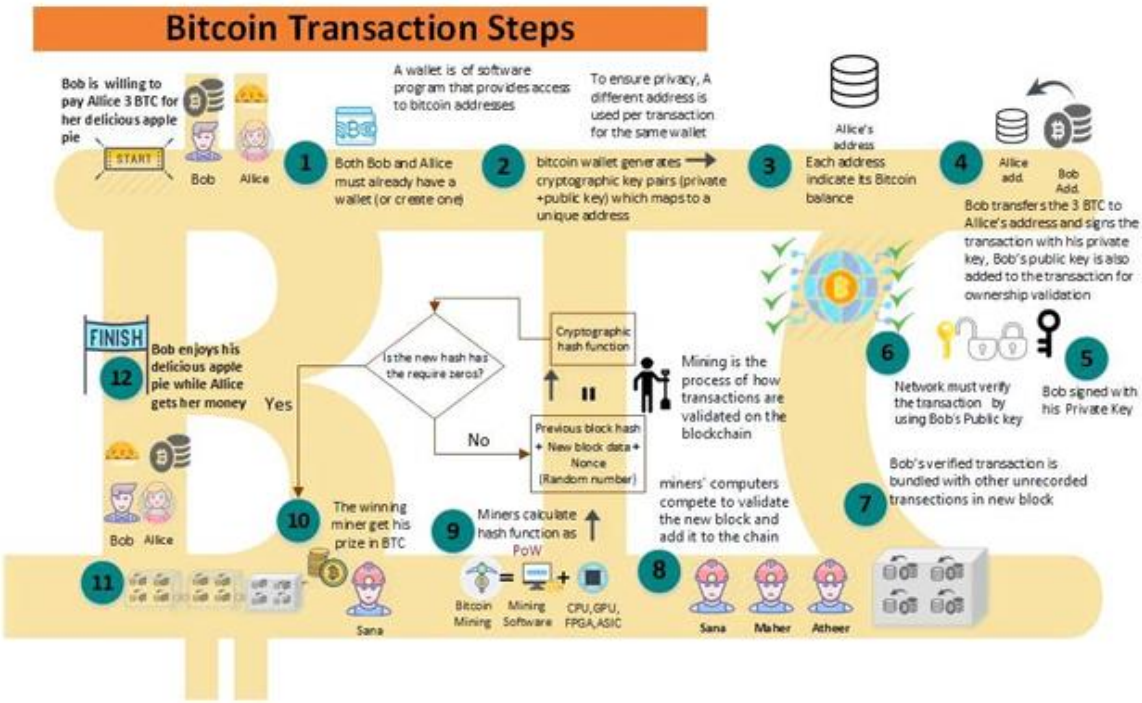

Figure 5 :Bitcoin transaction steps

.2 Cryptocurrency to business blockchain (C2B)

In this category of blockchains, there exists a logic tier within the ledger, furnishing a versatile programmable infrastructure. The public ledger not only archives financial transactions from consumers to businesses (C2B) but also incorporates provisions for deploying and executing programs within the blockchain system, commonly known as smart contracts. Smart contracts denote compact computing programs that automatically execute when specific conditions are met.

Due to the tamper-proof nature of smart contracts, expenses related to verification, execution, and fraud prevention are diminished. An illustrative example of this blockchain category is Ethereum, the second-largest permissionless network, introduced as a platform tailored for implementing smart contracts. Ethereum addresses numerous limitations of Bitcoin's scripting language, notably the prolonged delays in Bitcoin transactions, where the average time interval between blocks is approximately 10 minutes, compared to Ethereum's 13-15 second timeframe. One of Ethereum's significant advantages lies in its full Turing-completeness, signifying its capacity to support all forms of computations, including loops. Additionally, Ethereum facilitates state-of-the-art transactions and introduces various enhancements to the blockchain structure.

Ethereum's programmable platform capabilities have garnered significant appeal among users, enabling them to create personalized cryptocurrencies that can be utilized to initiate and fund smart contracts, while also having their own cryptocurrency (ether) for service payments. Ethereum has already found application across various fields, including keyless access, governance, crowdfunding, autonomous banks, and financial derivatives trading and settlement. These applications heavily rely on the utilization of smart contracts.

In the Ethereum blockchain, smart contracts are executed by Ethereum end-users (miners) locally, leading to the consumption of miners' computational resources. To address the issue of resource usage and compensate miners for their computational efforts, the concept of gas was introduced as a fee.

The gas cost is converted to Ether based on a user-defined gas price, representing the amount of Ether-per-gas that the initiator of a transaction is willing to pay. Typically, users set the gas price to a default market rate, often determined as the average of previously executed transactions

Another concept closely related to smart contracts is decentralized applications (DApps). These are open-source software that harnesses blockchain technology and are partly constructed with Ethereum smart contracts. Decentralized apps facilitate direct connections between users and providers, eliminating the need for third-party intermediaries. Unlike traditional applications, the backend of a DApp operates within a decentralized environment rather than on a centralized server. Similar to conventional apps, a DApp can consist of frontend code and user interfaces that communicate with its backend through an API. The frontend may be hosted as a website on a centralized server. (Sana Sabah Sabry, 2019)

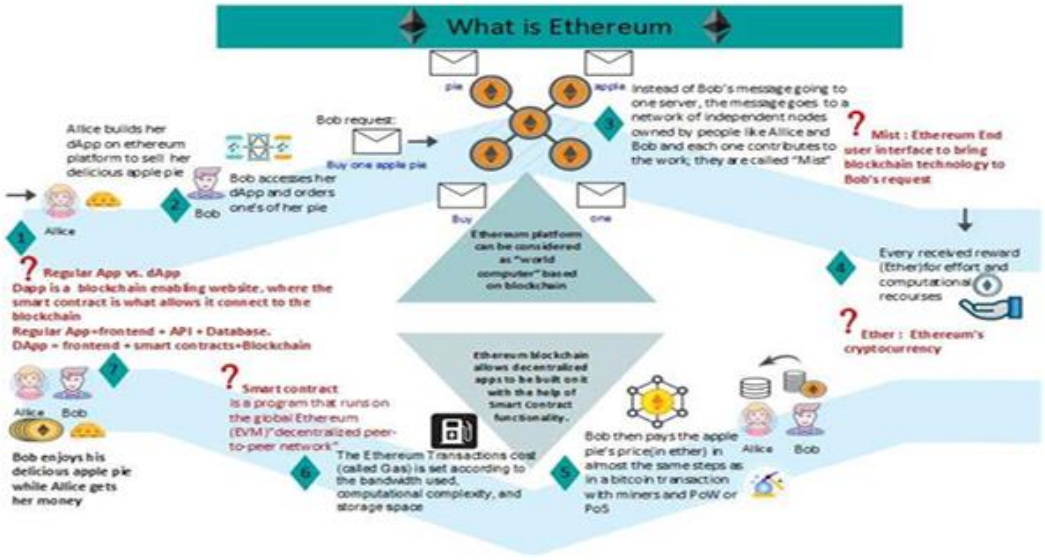

Figure 6: Different steps in the execution of smart Ethereum network

3. Business to business blockchains (B2B)

Here, no currency is supported, but software execution is supported for business logic, such as Hyperledger project. With the distinctive nature of each industry or business in their own way, their respective needs must be served with personized applications as well. The Ethereum blockchain network deploys a highly generalized protocol for everything that runs on its network. For instance, Hyperledger can be considered as software that helps people to develop personalized blockchains which will tend to their specific business needs. Organizations have started deploying blockchain technologies which are specifically developed for their specific needs in order to overcome some of the challenges with other types of blockchain, issues like privacy, scalability, and lack of governance

Unlike the other two blockchain types which rely on cryptocurrency, Hyperledger benefits from DLT without depending on any cryptocurrency]. Hyperledger is an umbrella project which has been hosted as a global partnership (of open-source blockchains and related tools) by the Linux Foundation since December 2015. Its membership cuts across several sectors, including finance, Internet of Things], banking, manufacturing, supply chain, and technology. Hyperledger system does not require the embedding of cryptocurrency or any form of mining operation it only allows users to develop the personalized private blockchain applications. Several blockchain projects like Sawtooth, Iroha, Fabric, Burrow, Indy, Caliper, and Cello are offered by Hyperledger system.

Hyperledger specification has several implementations from different vendors, such as Fabric, Sawtooth Lake, Corda, Iroha, Geid, and Burrow. Further discussions will focus on a specific blockchain platform, which is Hyperledger fabric

Fabric is a “modular and extensible open-source system for deploying and operating permissioned blockchain”. It is the first truly extensible blockchain system for executing

distributed applications. As it supports modular consensus protocols, it allows the building of a system based on the specific use cases and trust models. Fabric remains the first blockchain system to execute distributed applications which are written in multi-purpose standard programming languages without necessarily depending on any cryptocurrency (Sana Sabah Sabry, 2019)

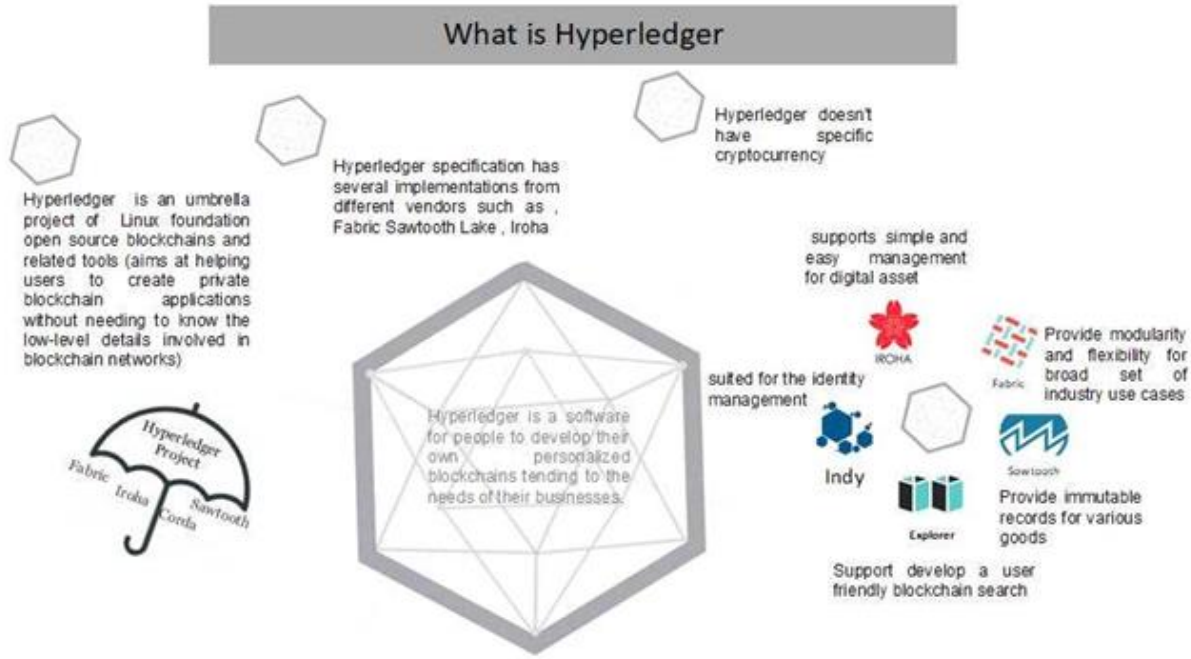

Figure 7 :Hyperledger fabric

5. Blockchain Components

Blockchain technology consists of several components, including some crypto graphic mechanisms (e.g., cryptographic hash function, cryptographic nonce) and data storage concept (e.g., ledger). To simplify the basic understanding, this section covers the details of the main components of blockchain: cryptographic hash function, cryptographic nonce, transactions, asymmetric-key cryptography, address and address derivation, blocks, and chaining of blocks

Cryptographic Hash Functions

Blockchain technology heavily relies on the concept of cryptographic hash functions. Hashing involves applying a cryptographic hash function to existing data, generating a unique output known as a digest for a given input data.

This process enables individuals to independently hash the same input data and derive identical results, thereby verifying the integrity of the data. Even the slightest alteration to the input data, such as changing a single bit, will produce an entirely different output digest.

Transactions

In the blockchain network, the interaction between parties is represented as a transaction. For users of the blockchain network, a transaction typically involves the transfer of cryptocurrency between users. Valid transactions are recorded within a block, and each block may contain zero or more transactions. In a blockchain environment, the continual creation of new blocks, even without transactions, is essential for maintaining security. This practice prevents malicious users from creating a longer, tampered blockchain. When making a transaction, a user of the blockchain network sends information that includes the sender's address and public key, along with an asymmetric cryptography-based digital signature. Additionally, transaction inputs and outputs are included. Transaction inputs specify the list or quantity of digital assets to be transferred, while transaction outputs indicate the amount of assets the receiver is supposed to receive.

Asymmetric-Key Cryptography

Within a blockchain network, asymmetric-key cryptography establishes a trust relationship among users, ensuring the authenticity, non-repudiation, confidentiality, and integrity of transactions while keeping them public. Each user possesses a public key and a private key. The private key is utilized for signing or encrypting a transaction, which is then propagated across the blockchain network, while the public keys are accessible to all users of the blockchain network, enabling them to decrypt the transaction. This setup guarantees authenticity, allowing the receiver to verify that the transaction was signed by the authenticated user. However, confidentiality is not automatically ensured. To achieve confidentiality, the sender can encrypt the transaction with its private key and the receiver's public key. Subsequently, the receiver can decrypt it using its own private key and the sender's public key.

Block

A blockchain block consists of a block header and block body. The block header holds the following properties:

• Previous Block Hash: A 256-bit hash value generated by the previous block. This hash value helps us to track the previous block and make a link.

• Timestamp: The current time of block creation.

• Merkle Tree Root: The block hash generated from the available transactions.

• Nonce: The full abbreviation of nonce is “number only used once.” The blockchain miner needs to solve or discover a number before participating in the validation of a block. Upon solving or discovering the number, the miner is given cryptocurrency for their efforts. The nonce is a way to exclude the less potential crypto miners. The block data is combined with a nonce to produce a unique hash digest hash (data + nonce) = Unique digest value

The block body comprises a transaction counter and a list of transactions. The capacity of a block to accommodate transactions is determined by both the block size and the size of

individual transactions. To verify the authenticity of transactions, an asymmetric cryptography technique, such as digital signatures, is employed.

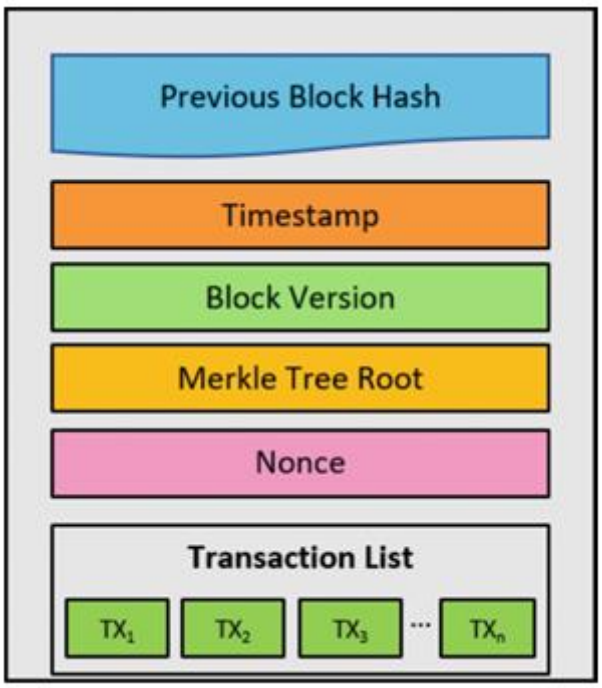

Figure 8 :A representation of a block structure

Chaining Blocks

In a blockchain, the blocks are linked together as each block holds the hash value of its previous block (parent block). (pardalos, 2021)

6. Blockchain application

The use of blockchain technology is gradually increasing in various fields such as financial services, education and training, healthcare, government and administration, travel and hospitality, and retail (Baliouz, 2023)

Application	Details
Medical and health data sharing	Blockchaincan be used to effectively share medical and health data in a secure and efficient manner.
NFT markets and sectors	Blockchain technology is applicable to NFT markets and sectors, providing transparency, security, and authenticity.
Music charge tracking	Blockchaincan be used to track music charges, benefiting artists and stakeholders in the music industry.
Cross-border payments with real-time IoT	Blockchain technology can be used to facilitate cross-border payments with the help of real-time IoT operating systems.
Personal identity security management	Blockchain can manage and update personal identity security, providing a more secure and efficient solution.
Anti-money laundering tracking systems	Blockchain technology is used in anti-money laundering tracking systems to prevent financial crimes.
Advanced supply chain and logistics monitoring and management	Blockchain technology can be used to enhance transparency and efficiency in advanced supply chain and logistics monitoring and management.
Logistics monitoring	Blockchain technology is effective for proper and reliable monitoring of logistics.
Modern voting mechanisms	Blockchain technology can help ensure transparency, security, and accuracy in modern voting mechanisms.
Advertising and marketing	Blockchain technology can be effectively used in modern advertising and marketing, including cryptocurrency exchanges.
Real estate transactions and other applications	Blockchain technology is valuable and mature when it comes to real estate transactions and other applications.

Table 2 :Blochchain applications (Baliouz, 2023)

7. Advantages and Limitations of Blockchain

Blockchain technology offers a wide spectrum of benefits, including decentralization, anonymity, persistence, and auditability. However, it also comes with its own set of limitations that must be taken into account when designing a system. A thorough examination of both the opportunities and limitations of blockchain is provided in.

Pros

1. Transactions in blockchain are secure and private due to the cryptographic techniques employed, ensuring that the identities of the parties involved are kept confidential while also safeguarding the integrity and confidentiality of the transaction data.

2.Accuracy is enhanced in blockchain systems because they eliminate human intervention and the need for paperwork, thereby reducing the potential for errors and ensuring the integrity of the data.

3. All transactions within a blockchain system are transparent, meaning that they are visible to all participants on the network. This transparency ensures accountability and builds trust among users.

4. Blockchain technology eliminates the necessity for third-party verification by enabling decentralized consensus mechanisms, where transactions are validated and recorded by the network participants themselves. This eliminates reliance on centralized authorities for validation, reducing costs and increasing efficiency.

5. A decentralized ledger, stored across all available users, makes it challenging to tamper with any content within the ledger. This distributed nature ensures the integrity and security of the data, as any attempt to alter information would require consensus among the majority of network participants, providing robust protection against unauthorized modifications. (pardalos, 2021)

Cons

1. Weak consensus mechanisms can lead to biased transaction verification processes.

2. The technology costs associated with conducting the overall process are high.

3. No type of blockchain ensures both strong security and faster processing simultaneously. For example, public blockchains offer greater security but slower verification processes. Conversely, private and consortium blockchains are faster but less secure due to centralization issues. (pardalos, 2021)

Topic two : Customs services

1. State functions and Customs

According to Montesquieu's theory, state power can be categorized into legislative, executive, and judicial branches. Within the executive branch, various state functions are delineated, each tasked with specific responsibilities and objectives related to the governance of the state. Renowned Latvian lawyer Karlis Dishlers defined the function of state power as the activity of any public authority aimed at accomplishing a lawful state task. Consequently, the effectiveness and efficiency of a distinct government institution (public office) can be assessed by evaluating the extent to which it fulfills the relevant state function for which it is responsible. (Chevers, 2013)

Customs functions are rooted in public functions, as the state and Customs have been intertwined concepts since ancient times. Aligned with the mission of the state, Customs surveillance and control of foreign trade deliver significant and tangible benefits to society and the national economy.

Instead of Montesquieu’s three state functions, Karlis Dishlers has defined 15 functions of the state power that can be combined into three groups:

1. Functions which organize the state.
2. Functions which support the state.
3. Functions which develop the state

Among these features there are some that Customs fulfils directly and those in which it is engaged indirectly.

The internal functions of the state are mainly performed in the sphere of the society management and they can be classified as follows:

- protecting the economic basis and any kind of property, facilitating market development;
- ensuring normal living conditions, society and personal security, settling social conflicts;
- raising cultural and educational level in a country;
- enacting law and order in a country, protecting human rights;
- ensuring the formation and use of the state fund for the benefit of society;
- protecting the environment

External state functions manifest in multiple facets, such as upholding peace and promoting peaceful coexistence, safeguarding a country's independence and territories, facilitating integration into the global economy, defending the rights of citizens residing in other countries, fostering cooperation with other states, and forging partnership relations to address global challenges.

The Customs service has more or less importance in implementing virtually all internal and external state functions. To assess the situation and to see the domain of Customs we need to distinguish and define key terms and concepts. (Chevers, 2013)

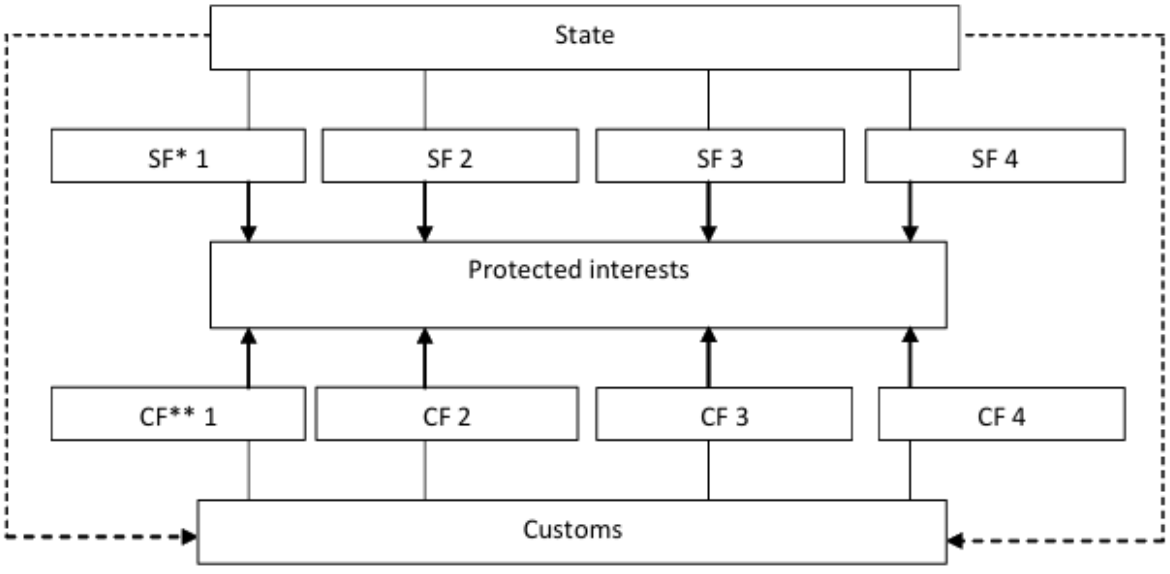

Figure 9 :Interrelation between state and Customs functions

Throughout the world, the Customs procedure generally entails the regulated movement of goods across the Customs border, including Customs payments, formalities, controls, and various mechanisms designed to enforce Customs policy.

When discussing the movement of goods across the Customs border, there are often contentious issues surrounding the division of concepts such as "Customs legislation" (which is frequently misused), "Customs," "Customs policy," and others. These concepts warrant examination to clarify their content and analyze their individual elements and components. Upon studying the definition of the term "Customs," it becomes evident that Customs is one of the functions of the state.

Analyzing the Customs procedure entails describing and evaluating its individual components and their interactions (system analysis) within a specific context. Examining the concept of the "Customs procedure" involves understanding its essence, meaning, and content, as well as elucidating its ideal characteristics and operational requirements. (Chevers, 2013)

2. Basic concepts about customs and customs work

Customs is defined as "an authority or agency in a country responsible for collecting customs duties" and ensuring the protection, control, and regulation of the flow of goods, including animals, personal belongings, and hazardous materials, both entering and leaving the country. Depending on local legislation and regulations, certain goods may be subject to restrictions or prohibitions on import or export. The Customs Agency is tasked with implementing and enforcing these rules. (Selçuk Balı, 2022)

Indeed, the provided definition overlooks several core functions that fall within the realm of customs, including the management of passenger and crew movements, transit operations, means of transportation, transportation equipment, coastal and land border control, as well as fostering partnerships with industry and other government agencies. The global role of customs is complex and relatively poorly understood, encompassing a broad spectrum of responsibilities beyond the collection of customs duties. (Chevers, 2013)

Customs is defined as "the government service responsible for managing customs and collecting duties and taxes, which also bears responsibility for enforcing laws and other regulations related to the import, export, transportation, or storage of goods." This comprehensive definition acknowledges the multifaceted role of customs agencies in managing various aspects of international trade and ensuring compliance with relevant laws and regulations. (Journal World Customs, 2007)

The passage underscores that customs denotes the governmental entity tasked with enforcing and overseeing customs laws and regulations concerning the import, export, transportation, and storage of goods. Its responsibilities include collecting duties and taxes, regulating the flow of goods in and out of the country, and overseeing the movements of passengers and crew. This encompasses various means of transportation and transportation equipment, alongside coastal and land border control, transit fees, and collaborations with industry and other government bodies. Customs emerges as a multifaceted administrative organization dedicated to facilitating the secure and lawful movement of goods and people across borders. (Chevers, 2013)

3. Different treatment of concepts and types of Customs functions

Issues concerning Customs functions and tasks are interpreted in different ways, although their meaning and content are rather definite. The difference lies in the aspect from which aspect a specific issue should be considered, whose interests should be protected, at which level and in connection with which external circumstances these issues become timely. It also depends on the interests from which Customs and results of its activities are considered. International organizations, the governing body of the country, other institutions of governmental authorities, Customs services of other countries, participants of foreign economic relations, individuals and companies, representatives of different social strata, groups of different interests are interested in successful work of Customs.

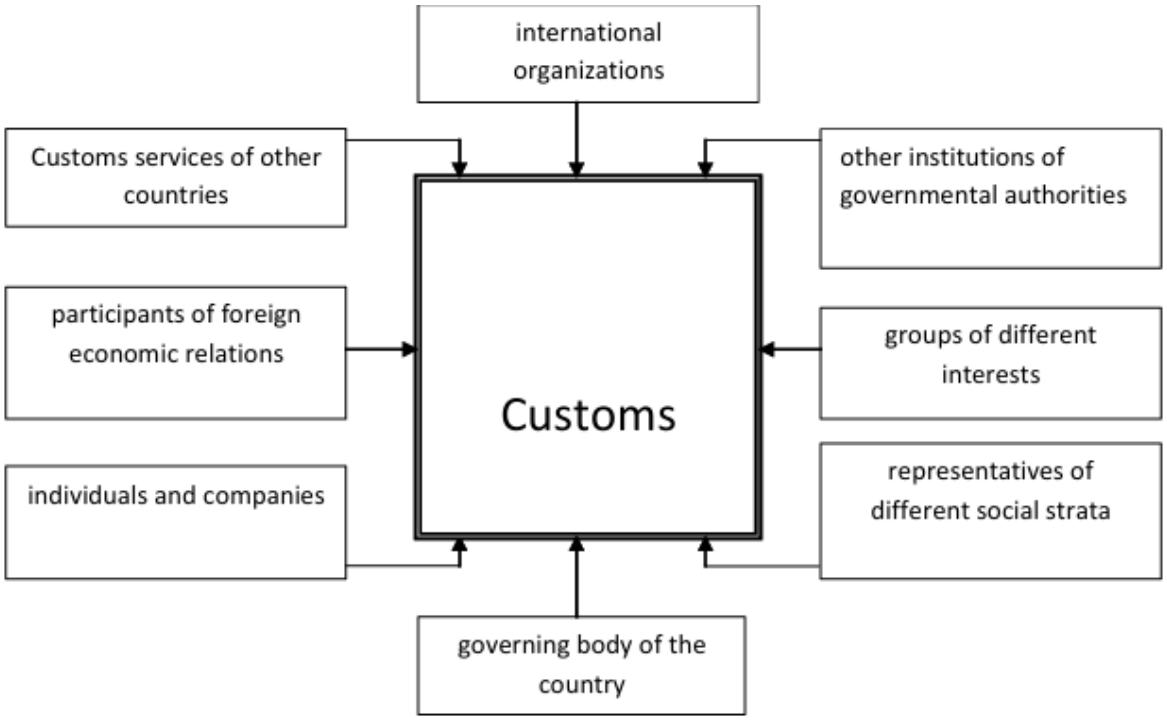

Figure 10 :Parties interested in the results of Customs activity

National and regional legal acts regulating the Customs activities, international agreements and treaties should be considered as an important source that indicates the current Customs functions. We should also take into consideration the opinion of international organizations, as the basis for the Customs officers' work is the international flow of goods and everything that is related to it. Definition of the functions and tasks of Customs at the international level can be found in the documents of such international organizations as the WCO, the WTO, the WB, the IMF, the ICC

In accordance with the views of the World Bank's experts, traditional functions of Customs are as follows:

- collecting certain taxes and duties (Customs payments);
- protecting the domestic market (manufacturer);
- securing movement of goods;

- removing attempts to import banned and hazardous goods and materials;
- combating international drug trafficking;
- facilitating international trade in accordance with the WTO rules.

Within the framework of the United Nations the working group dealing with trade efficiency of the Trade and Development Board (1994) has developed the draft guidelines of Customs to improve the effectiveness of trade. The main provisions say that Customs plays a significant role in the international trade. The Customs interferes with every international trading transaction, at least twice, – during import and export processing. Therefore, it is clear how the Customs has a considerable effect on the circulation of goods across national borders.

The COLUMBUS programme developed by the WCO describes how it understands Customs functions and trends in their development.

Having determined that the main duties of the Customs are timely collecting payments, revenue record keeping, providing proposals as to the main provisions for trade and fiscal policy, facilitating trade, protecting society, providing accurate information, establishing the professional and integral administration which carries out best international practice, fairly performs its duties and works more and more effectively, we define the main functions:

- - implementing national trade and fiscal policy, making suggestions for its development;
- - promoting trade;
- - protecting the state and society;
- - securing the international trade supply chains and implementing international commitments related to it;
- - providing accurate statistical data.

The most important instrument in the sphere of international multilateral treaties is the KYOTO Convention. If the document does not mention the Customs functions, it defines the tasks to be performed in order to implement these functions nationwide:

- - differences among Customs procedures and practices should be eliminated, there is a need to simplify and harmonize procedures, to contribute to the creation of international Customs standards and to improve the effectiveness of Customs;
- - there is a need to exchange information regarding Customs and regulations, the principal administrative directions, procedures and practices;
- - it is also necessary to introduce advanced technology, risk management and Customs-audit control;
- - there is a necessity for internal and external cooperation between national Customs and trade associations;
- - it is essential to implement various international standarts.

What is meant here is promoting the international trade together with enhancing the efficiency of Customs.

Regional legal acts regulating the activities of Customs are to be considered as very significant sources which define the present-day functions and tasks of the Customs service. Undoubtedly, for the European Union it is the Customs Code of the European Union.

The Customs Service of the United States lists the following features on its home page:

- - implementation of the Customs rules concerning import and export trade in the ports of the United States;
- - calculation and collection of duties for the imported goods;
- - control of import and export of goods;
- - actions as the first defensive line in the national fight against drugs at entry ports;
- - the fight against smuggling and fraud. In its turn the main objectives of the Russian Customs service are as follows:
- - to improve the level of compliance with Customs regulations, to ensure the full and timely payment of Customs charges;
- - to improve the quality of services provided by the Customs, to reduce the number of the participants in foreign economic relations and to cut down government expenditures aimed at Customs clearance and control;
- - to detect cases of smuggling weapons, drugs, counterfeit and other goods prohibited for import and export.

The following tasks for Latvian customs are defined in the law on the State Revenue Service:

- to monitor compliance with legislation in the Customs sphere;
- to apply Customs tariffs, to monitor the implementation of the permit system on export and import of goods and other items, to collect state taxes, Customs duties and other payments established by the State which should be paid at the customs border in accordance with the legislative acts;
- - to cooperate with foreign Customs to detain the import and export of smuggled goods and conventionally prohibited items;
- - to provide the report on statistics and Customs activities in accordance with the procedure established by law;
- - to provide state institutions, entrepreneurs, organizations and individuals with information on Customs matters in accordance with normative acts, to train specialists and to improve their qualification in Customs-related sphere;
- - to cooperate with the institutions of the public administration and control as well as with human rights institutions;
- - to carry out international commitments which the state has taken in relation to Customs;
- - to investigate cases of criminal offences in the Customs sphere.

Comparing this list with the practice, it should be noted that there is a range of tasks not reflected in this legal provision. Probably it is so because providing the accurate list of Customs purposes is not the target of the regulation.

As far as the quality management of Customs activity is concerned the Customs functions can be grouped into 11 subsystems:

- - general functions;
- - Customs personnel;
- - function of documentary support
- - import/export Customs clearance and Customs control;
- - Customs payments and statistics;

- - legal support of Customs activity;
- - combating Customs offences;
- - information technologies as well as technical resources support;
- - accounting;
- - internal security;
- - Customs borders and Customs infrastructure protect

However, not to confuse functions with the tasks so that Customs functions should comply with the principal guidelines of the state and the law theory, they should not be considered in a broad sense and their number should not be high.

As David Widdowson has mentioned in the World Customs Journal, the Customs has always traditionally been responsible for the implementation of the policies of many countries in such spheres as payments collection, trade development, control over the movement of the prohibited substances, protection of the cultural heritage and intellectual property

Constituents of Customs activities have always been turned towards achieving economic, protecting and regulating purposes. In other words, Customs needs to carry out protective (which develop legal trade), statistical and fiscal functions. (Chevers, 2013)

4. Customs tasks in accordance with international organizations

A- According to the World Bank: According to the World Bank's view, the traditional functions of customs are as follows

- Collecting certain taxes and fees;

- Protecting the local marke
- Securing the movement of goods

- Eliminate attempts to import prohibited and dangerous goods and materials;

- Combating international drug trafficking;
- Facilitating international trade in accordance with the rules of the World Trade Organization.

B- According to the World Customs Organization: According to the Columbus Program of the World Customs Organization, customs tasks are arranged as follows:

- Collection, accounting and revenues;

- Implementing national trade and financial policy and submitting proposals for their development;

- Encouraging legitimate trade;

- Protecting the state and society;

- Securing supply chains for international trade and implementing related international obligations;
- Providing accurate statistical data. (Ghazzalin, 2023/2024)

5. Means of customs administration

The Customs Administration uses many means to carry out its tasks, in order to achieve the planned objectives These means are divided into three categories: legal means, material means, and human means.

-1 Legal means: Legal means are considered among the most important customs means because they determine customs tasks, which are as follows:

Customs law It is considered the first means followed by the Customs Administration, and as a customs guide that protects Customs Authority employees from performing their duties. It is also considered a reference that includes regulations and legislation related to customs activity. This law is applied throughout the entire national territory. The Customs Law contains 340 articles and legal texts, and this is according to the new amendment to the General Law. 1992, and in 2000 it began to contain 400 articles and legal texts distributed into 15 chapters after Parliament approved it.

Finance law The Finance Law is expressed in a document that includes the total expenditures of the countries in addition to direct and indirect taxes and fees, as well as the various incomes during the year for the benefit of the state in accordance with the applicable laws and regulatory texts. This law is issued once every beginning of the year and the Customs Administration must follow every change mentioned in the Finance Law.

International law It is a set of international laws known to the customs administration, and it is specific to the laws of the Customs Cooperation Council (CDD) and the Customs Tariff Organization, as well as the European Common Market (CEE) and all international organizations that have relations with Algeria.

-2 Human means: It is represented by the human element among the cadres of customs agents, who are agents of the state and their organization in the departments varies according to the tasks assigned to them, starting from the general director up to the control assistant. The customs administration has also resorted to establishing centers to train the cadres and agents before they begin to carry out their work.

Administrative pole: Followed by public officials to conduct their economics in automated information, statistics, training, disputes, and accounting

Technical pole They are represented in the category of customs agents

Customs agents, of all ranks, must take an oath before the court located within the jurisdiction of the headquarters in which they are appointed. It shall be registered at the court clerk's

office. The document for taking this oath shall be exempt from stamp and registration duties and shall be recorded free of charge in the compensation cards.
The category of customs agents consists of:
- Brigade Officier: lower than baccalaureate level
- Surveillance officer: His level is a division officer + 5 years or a baccalaureate + at least two years of university education
- Chief Inspector: Supervisory officer level + 5 years or graduate from the National School of Administration
- Divisionnaire Customer Inspector: Lead Inspector + 5 years or graduate from the Customs Excise Institute, IEDF.
- General Controller: Dean Inspector + years
Human resources depend on the following financial resources: management budget and equipment budget

Management budget: It aims to cover human expenses for one year, and contains:
- Wages and salaries of customs officials
- Formation expenses
- Maintenance costs
Equipment budget: Its duration can be between 3 to 5 years, because it requires the state to establish a school building project, a customs office, and purchase machinery and equipment.

-3 Material means: These are all the means used by customs departments, including books and equipment, especially in our time, with the emergence of automated media, its development, and openness to the world. The customs administration has also strengthened the information system in all its centers. (Ghazzalin, 2023/2024)

Topic three : the relationship between customs and blockchain

1. The use of blockchain technology in customs activities

In the realm of foreign trade, logistics activities encompass several crucial tasks. These include packing goods, loading them into containers, trucks, or wagons at the departure factory or warehouse, pre-transport of goods (moving them to the port, airport, or grouping platform), handling customs clearance formalities for both export and import, organizing the primary transportation, arranging insurance for international transit, and managing post-transport activities such as unloading goods from the transport vehicles.

Blockchain technology is revolutionizing the delivery of goods by streamlining processes and reducing delivery times. Its inherent transparency and reliability instill confidence among foreign trade participants. Consequently, an increasing number of international companies are drawn to integrating blockchain into their operations, recognizing its myriad benefits.

Blockchain technology facilitates access to and verification of documents online by various stakeholders such as importers, exporters, banks, and customs regulatory authorities. This technology has the capability to streamline export and import transactions by eliminating the need for multiple intermediaries, thereby reducing time, costs, and enhancing risk management. This characteristic of blockchain proves especially advantageous in transactions involving a multitude of participants, making it an attractive solution for modernizing trade processes. (Belu, 2020)

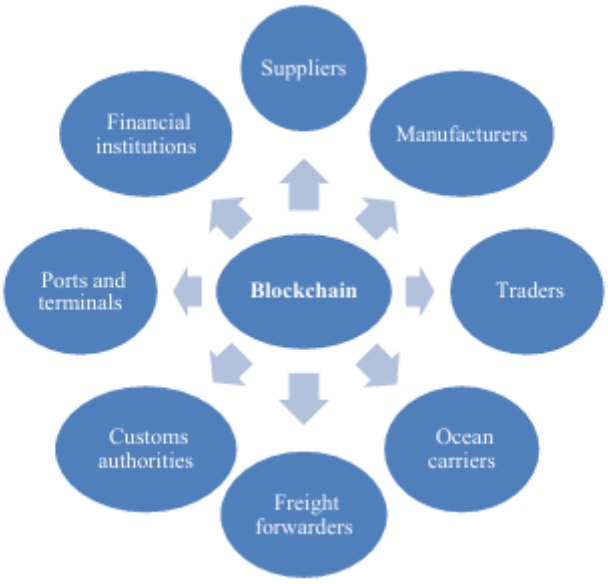

Figure 11 : Blockchain participants in the case of an export-import transaction

Implementing blockchain in customs clearance activities offers several advantages. These include enhanced physical control of goods, a reduction in the number of physical documents required, and the ability to track shipments end-to-end. Moreover, blockchain technology significantly minimizes the risk of alterations to information entered in documents, as data stored in the blockchain is immutable. These benefits contribute to more efficient and secure customs clearance processes, ultimately improving overall trade operations.

Applications utilizing Distributed Ledger Technology (DLTs) in international trade have the potential to streamline processes by reducing the vast volumes of documents and numerous bureaucratic interventions involved. Customs administrations stand to enhance their risk management capabilities through the implementation of such technologies, thereby facilitating smoother trade operations. In supply chain management, blockchain applications enable participants to continuously update information, ensuring the accuracy and reliability of data from the procurement of raw materials to the ultimate delivery of products to end-users. This transparency and efficiency contribute to a more seamless and accountable supply chain ecosystem.

Presently, the expenses associated with the customs clearance process, as well as the delays in obtaining customs clearance for exports and imports, significantly impact the ease of conducting these transactions.. In many cases, exporter/importer have to present import or export authorizations for goods, such as licenses, but also other documents, depending on the nature of the marketed products (e.g. phytosanitary certificates, other documents necessary for health protection or human, animal or plant safety). "The final arbiter in a border transaction is customs authority, whose role is to ensure that all these documents have been obtained, that they are valid and that the goods have been lawfully declared". (Belu, 2020)

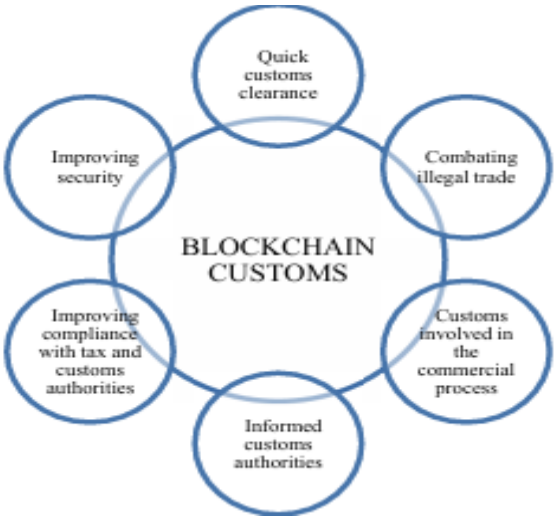

Figure 12 :Customs part of a blockchain network Source

2. The advantages of using blockchain technology in the customs activities

a. Reduction of waiting times at customs: customs clearance at import /export will be obtained much faster

Blockchain facilitates the verification of the identity of the participants involved in an export-import transaction (for example, authorized economic operators – AEO). Various organizations, such as UN/CEFACT, WTO, are studying how the technology could be implemented and integrated with existing customs systems and certification processes.

By leveraging blockchain and other advanced technologies, the customs authority can gain a more comprehensive understanding of international trade transactions requiring customs clearance. This heightened visibility enables customs officials to access detailed information regarding the nature of goods, their route, and the various participants involved in commercial transactions. As a result, customs authorities can effectively manage risks associated with customs clearance, leading to expedited processing times and smoother trade operations.

For example, the implementation of the “single window” (International Trade Data System – ITDS) in the USA aims to streamline the customs clearance process by providing a single platform in which all transport data and documents are entered and managed. The “single

window" has been promoted by several international organizations, such as UNECE, OMV and ASEAN. However, over the last two decades, the "single window" effort has generally focused on providing traders with a single point of entry for the transmission of electronic and standardized information to the government in connection with customs transactions. (Belu, 2020)

b. Facilitating international trade

Blockchain technology offers immense potential for customs administrations and other institutions engaged in export-import operations to enhance their risk analysis and management capabilities, thereby fostering the advancement of international trade. By integrating blockchain into their operations, customs authorities can establish a unified platform that connects all relevant business entities, facilitating seamless information exchange among stakeholders.

This integration enables customs authorities to access comprehensive information pertaining to exports and imports, including details such as sellers, buyers, prices, quantities, carriers, financing, and insurance. Furthermore, blockchain technology allows for real-time tracking of the location and status of goods throughout the entire supply chain. This increased transparency and efficiency enable customs authorities to make informed decisions and respond swiftly to emerging risks, ultimately promoting smoother and more secure international trade transactions.

c. Compliance with product safety/conformity standards

The escalating concerns surrounding the quality and safety of imported products necessitate the submission of various documents, including import/export licenses, sanitary certificates, phytosanitary certificates, among others. Blockchain technology offers a unified platform where manufacturers, logistics operators, regulators, and consumers can access comprehensive information regarding the origin of products, their certification, and the issuance of import/export licenses.

Furthermore, blockchain ensures the integrity of electronic certificates by verifying that they are properly issued and signed by valid regulatory/issuing agencies. This safeguards certificates against any risks of alteration, tampering, or misuse of their contents.

By integrating customs authorities into a blockchain network, goods can undergo automated customs clearance if they have been pre-checked and registered in the customs database at an earlier stage. This streamlined process enables goods to be cleared without the need for physical inspection at the time of declaration, thereby expediting trade flows while maintaining regulatory compliance and security standards. (Belu, 2020)

d. Much easier identification of the origin of goods subject to export import transactions

Blockchain technology empowers the customs authority of the importing country to effectively monitor the origin of imported goods, thereby combating the trade of counterfeit products. This innovative technology enables the seamless storage of information throughout the lifecycle of traded goods, including production, verification, transportation, and customs clearance phases.

Each item is assigned a unique identification code, facilitating enhanced transparency in the logistics process. By leveraging blockchain, customs authorities can track the entire journey of goods, ensuring their authenticity and adherence to regulatory standards. This capability not only strengthens efforts to combat counterfeit trade but also fosters greater trust and reliability in international commerce.

e. Reduction of tax evasion – VAT to be collected

A significant challenge for tax authorities is narrowing the gap between the projected revenue for value-added tax (VAT) and the actual collection. Blockchain technology offers a solution by enhancing transparency and traceability, enabling the detection of fraud and errors with ease. Real-time exchange of information among customs offices, exporters, importers, and other stakeholders empowers customs authorities to swiftly identify fraudulent practices.

Within a blockchain network, customs authorities are equipped with real-time information, enabling them to proactively manage risks associated with export-import operations. For instance, fraudulent gains often stem from overvaluing or undervaluing traded goods or fabricating routes and transshipment points. Blockchain technology promotes legitimate trade by streamlining customs processes and reducing bureaucracy.

Looking ahead, more blockchain-based platforms incorporating customs authorities are expected to emerge. However, a potential challenge lies in interconnecting all customs authorities to ensure seamless access to stored information. To address this, public blockchains may be favored to enhance accessibility, although this approach could compromise network member trust.

g. Digitization of customs documents

The digitization of customs documents is a crucial aspect of the transactional process in export-import operations. These documents play a pivotal role in facilitating the transfer of ownership over goods and ensuring the payment of their value. By transitioning these documents to digital formats, the efficiency and accuracy of the transactional mechanism can be greatly enhanced. This digitization streamlines the documentation process, reduces the likelihood of errors, and enables faster processing times, ultimately contributing to smoother and more efficient export-import transactions.

The digitization of customs documents (mainly the customs declaration) makes it easier to manage the documents required to obtain customs clearance. Customs clearance of goods in the classical system requires, from the point of view of documents, a fairly large amount of evidence: the manifest, transport document (B/L, AWB, CMR/CIM documents), packing list, invoice, certificate of origin and so on (Belu, 2020)

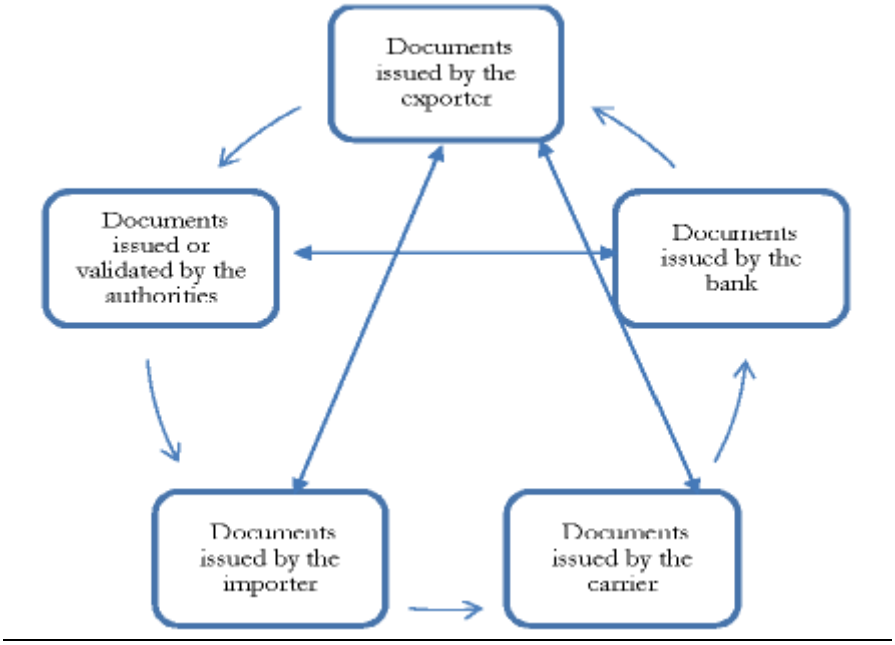

Figure 13 : Export and Import Documentation

3. Implications of blockchain for Customs

Blockchain technology has the potential to revolutionize international trade by reducing paperwork and bureaucratic interventions. It can be applied to trade-related applications, such as transport and goods flow, by digitizing financial instruments and traditional trade and shipping documents. Blockchain case studies have expanded beyond financial services to include transport and physical goods flows.

Customs would become more data-driven

The blockchain technology offers Customs administrations and border agencies a powerful tool to enhance risk analysis, trade facilitation, and supply chain management. By utilizing Permissioned blockchains, which provide clear roles, responsibilities, and access levels, Customs can securely share information among stakeholders while maintaining confidentiality. This fosters transparency and trust within the supply chain and enables seamless data exchange.

Automated extraction of information from primary sources improves data accuracy and quality, reducing manual verification burdens and speeding up Customs declaration processing. Sharing data through Permissioned blockchains ensures that regulatory authorities have access to reliable information from trusted sources, promoting efficient cross-border data exchange in a Single Window environment.

Addressing concerns about product quality and safety, blockchain enables comprehensive product lifecycle management by facilitating access to information such as provenance, testing, certification, and licensing. It ensures the integrity of electronic certificates and

protects them from tampering or misuse, thereby enhancing regulatory compliance and consumer trust.

Customs would be more embedded within the trade process

Incorporating blockchain into Customs practices involves establishing a shared platform with trade-related entities like banks and freight forwarders. Participation of numerous shippers and consignees isn't essential; what matters is the accessibility of information recorded by these entities on a distributed ledger. Customs can then verify data against their database, automating clearance for pre-screened goods. This optimizes resource allocation and enhances efficiency in trade facilitation.

Blockchain would favour revenue compliance and cooperation between Tax and Customs

Blockchain technology offers promise in aiding tax authorities to address VAT revenue discrepancies by enhancing transparency and detecting fraud more effectively. However, implementing blockchain in tax systems faces challenges, such as ensuring universal digital data submission from taxpayers. Similarly, while blockchain can streamline trade-related processes for customs, widespread adoption of smart contracts may prove challenging. Nonetheless, blockchain's application in facilitating real-time information exchange between customs and tax authorities holds potential for combating fraudulent practices and improving revenue collection mechanisms.

Blockchain would help to combat financial crimes

Authorities combating cross-border financial crimes should prioritize establishing and strengthening cooperative relationships. Blockchain-based applications can aid in addressing issues like money laundering, terrorist financing, and illicit financial flows. Trade-based money laundering (TBML) schemes often exploit legitimate trade transactions, complicating documentation. Red flag indicators for TBML, such as false reporting and unusual shipping routes, can be detected in real-time by Customs officers. The Financial Action Task Force (FATF) advocates for countries to grant investigative authorities timely access to trade and financial data.

Permissioned blockchains can facilitate collaboration among Customs and other relevant authorities involved in criminal investigation, intelligence, revenue collection, and financial services. This shared platform enables timely sharing of updates on taxpayers' trade practices and banking transactions. Access to financial institutions' blockchain ecosystems helps authorities stay informed about events within the banking system that could be exploited for concealing illicit financial flows. Customs can enhance their detection capabilities by comparing trade data with capital transfer records from financial institutions, thereby improving the likelihood of identifying financial crimes. (Okazaki, 2018)

4. Potential Implementations of Blockchain on Customs

1. Clearance of Custom Documentation

In international trade, the main parties involved are traders, governments, business consortiums, insurance companies, and financial bodies like banks or creditors. Customs procedures are often cumbersome, requiring extensive manual verification of documentation, which can lead to delays and increased costs. Blockchain technology offers a solution to automate these procedures, providing better audibility and expediting the processing of international trade.

Various documents are involved in the international trade process, including packing lists, bills of lading, export documentation, certificates of origin, and customs clearance documents. Blockchain platforms can globally manage these records, ensuring transparency and reducing the risk of fraudulent activities.

The motivations for using blockchain in customs procedures include cost reduction, faster processing times, and increased security. Blockchain's decentralized and transparent nature helps prevent fraudulent activities and allows for pre-approval facilitation. Moreover, it enables paperless trade initiatives, such as converting paper-based processes to digital files and transferring them to a common ledger, thereby saving costs and reducing delays.

Projects like the IPCSA Blockchain BoL aim to transform paper-based processes, such as bills of lading, into digital formats using blockchain technology. Smart contracts and workflows further streamline processes, reducing handling times and increasing efficiency.

However, it's crucial to ensure compliance with existing regulations before implementing blockchain solutions. For example, the Rotterdam Rules must be considered when using blockchain for bills of lading, as they cover electronic transport records.

Another potential application of blockchain is in verifying free trade agreements (FTA), which are currently paper-heavy and inefficient. Blockchain-based FTA verification has the potential to eliminate cargo delays, penalties, and fraudulent document filings, thereby improving trade efficiency and compliance.

2. Tracking of Operations

Blockchain technology offers traceability, enabling parties to record a chain of transactions and the movement of goods internationally with instant and accurate information, thus alleviating the complexities of paperwork for traders, government agencies, and third parties like banks and carriers. The COVID-19 pandemic highlighted the importance of traceability in ensuring product quality and safety, especially in the context of health concerns. Blockchain's transparency can help combat bribery in customs procedures, particularly in trade between corrupt countries.

Several pioneers are implementing blockchain in traceability platforms. For example, VeChain has developed a food traceability platform for Walmart China, enabling the sharing of product information across the food supply chain and encrypting data on the blockchain for enhanced security. Additionally, the Department of Homeland Security is testing blockchain

for security purposes at US ports of entry, aiming to detect and prevent intruders from tampering with security devices or data.

.3. Acceleration of Whole Procedures of Trade and Customs

The globalization of e-commerce has made foreign-origin products more accessible to end customers, prompting companies to deliver products faster to remain competitive. Blockchain technology has the potential to accelerate international trade processes, especially in transactions involving parties with limited trust, such as different governments, institutions, and providers.

Key premises of blockchain technology for international trade include simplified business processes, security by design, transparency, and immutable audit trails and workflows across organizations. While blockchain can ensure that uploaded data is not tampered with, it does not guarantee the accuracy of recorded data.

Private permissioned blockchains managed by parties involved in international trade can streamline procedures, making them business-friendly, fast, accurate, and cost-effective. Standardizing infrastructure and gaining authorities' acceptance for using these platforms are essential.

Blockchain implementation in letter of credit and origin procedures can reduce bureaucracy and speed up documentation processes. Cloud-based permissioned blockchains can efficiently store and track information related to the processing and origin of goods. Initiatives for electronic certificates of origin aim to simplify and secure international exchanges by reducing the risk of forged declarations.

Smart contracts enable small-medium enterprises to participate in international trade with lower costs and fewer bureaucratic barriers. They reduce legal and procedural costs, secure against non-payment risks, and shorten procedures. Blockchain-based customs practices can lower costs and streamline trade procedures, facilitating access to trade finance for small-medium enterprises. (Gürcan, 2021)

Conclusion

In summary, this literature review has shed light on the concepts, characteristics and types of blockchain technology, as well as the complexities and challenges of customs services. We also explored the potential benefits and challenges of blockchain implementation in customs services and proposed a framework for blockchain implementation to facilitate successful integration.

Blockchain technology has several unique features, including being timestamped, being nearly unhackable, and its traceability, transparency and auditability. These features have already started revolutionising both governmental and private sector transactions; being stakeholders of today's supply chains, governments, Customs and business have already started cultivating the benefits of this technology.

Blockchain technology brings several benefits to customs activities , including improved traceability, increased transparency, increased efficiency, reduced fraud, and increased trust among stakeholders. However, to reach their full potential, challenges such as the shortage of both strong security and faster processing , weak consensus mechanisms must be addressed.

Chapter Two : Case study

Preamable

In exploring the integration of blockchain technology into customs procedures in the European Union (EU) and Turkey, significant benefits emerge. Blockchain offers a decentralized, secure, and transparent platform for recording and verifying trade transactions, streamlining processes, and reducing paperwork. Key advantages include enhanced transparency and traceability, streamlined documentation processes, automated payment and settlement, and improved inter-agency coordination. Overall, blockchain has the potential to revolutionize cross-border trade by fostering efficiency, transparency, and security while facilitating smoother customs operations in the EU and Turkey.

Topic one : European Union

1. A brief history of the Eropean Union

In 1993, the European Community (EC) transitioned to the European Union (EU), marking a significant milestone in their journey towards international integration. This change, akin to the earlier shift from "European Economic Community" (EEC) to "EC," symbolized progress. The Maastricht Treaty on European Union formalized this transition, heralding "a new stage in the process of creating an ever closer union among the peoples of Europe." Notably, the treaty outlined the introduction of a single European currency, the "euro," by 1999, under the framework of "Economic and Monetary Union" (EMU), signifying a radical overhaul of Europe's economic landscape.

The transition to the euro, spanning from 1999 to 2002, represented the largest peacetime logistical operation in history, successfully uniting most of Europe's national currencies. This achievement marked a significant milestone, realizing the aspirations of the EEC's founders. However, while the euro symbolized the culmination of a substantial political endeavor, it also highlighted the inherent ambiguities within the integration project. Initially, only twelve of the fifteen EU members adopted the euro, a number that has since increased to sixteen out of twenty-seven. This discrepancy fueled debates over the necessity of further economic governance reforms, which were curtailed by the complexities surrounding the EU's expansion into Eastern Europe.

Despite the transformative impact of fifty years of integration, the EU remains enshrouded in uncertainties. Fundamental questions persist regarding its institutional objectives and membership criteria, reflecting an ongoing identity crisis. As European leaders navigate these challenges, the EU's powers and legislative scope, once abstract debates, now hold tangible significance. Thus, while the EU has achieved remarkable success, it simultaneously grapples with existential uncertainties as it enters the new millennium. (Parson, 2019)

2. The European Union in brief

At the heart of the EU lie its Member States, encompassing the 27 countries united within the Union alongside their citizens. What distinguishes the EU is its unique approach: despite being sovereign entities, these nations have opted to combine some aspects of their sovereignty to enhance their collective strength and reap the benefits of scale. This pooling of sovereignty entails Member States delegating certain decision-making powers to jointly established institutions, enabling democratic decision-making on matters of mutual interest at the European level. Positioned between the fully federal system of the US and the more

loosely structured intergovernmental cooperation of the United Nations, the EU has made significant strides since its inception in 1950.

Notable achievements include the creation of a single market for goods and services spanning 27 countries, offering 500 million citizens the freedom to move and settle across borders. The introduction of the euro as a major global currency has further bolstered the efficiency of this single market. Additionally, the EU has emerged as the world's leading provider of development and humanitarian aid programs, among other accomplishments.

Looking ahead, the EU is actively working to address current economic challenges and combat climate change. It is also engaged in expanding its influence by assisting neighboring countries in their preparations for potential EU membership and promoting a unified policy framework that fosters European values worldwide. The realization of these ambitions hinges on the EU's ability to make effective and timely decisions, as well as its capacity to implement them efficiently. (How the European Union work, 2012)

3. The goals and values of the European Union

All countries within the EU collaborate to ensure several key objectives: maintaining peace in Europe, fostering well-being for all citizens, promoting fairness and inclusivity, preserving and respecting diverse languages and cultures, and nurturing a robust European economy facilitated by a common currency for seamless business transactions. Shared values among EU member countries include the promotion of equality and the protection of individual rights. Since its inception, the EU has effectively prevented conflicts among its member states, fostering a continent-wide atmosphere of cooperation and peace.

In recognition of its efforts to maintain peace and promote unity, the EU was awarded the prestigious Nobel Peace Prize in 2012. This acknowledgment underscored the EU's significant role in fostering harmony and collaboration across Europe. Furthermore, the EU has facilitated the free movement of people within its member states, allowing individuals to

live, study, or work in any EU country of their choice. For instance, a French citizen can opt to relocate to Italy for employment or educational pursuits, thanks to the opportunities provided by the EU's policies. (Nareth, 2021)

4. What are the main institutions of the EU

There are seven official EU institutions, which may be roughly grouped by their executive, legislative, judicial, and financial functions.

- The European Council, a grouping of the EU's top political leaders, consists of the president or prime minister of each member state. Its summits set the union's broad direction and settle urgent high-level questions. Its members elect a president, who can serve to two two-and-a-half-year terms. the present president is former Belgian Prime Minister Charles Michel.
- The European Commission, the EU's primary executive body, wields the foremost day-to-day authority. It proposes laws, manages the budget, implements decisions, issues regulations, and represents the EU round the world at summits, in negotiations, and in international organizations. The members of the commission are appointed by the EU Council and approved by the EU Parliament. The present commission is led by former German Minister of Defense Ursula von der Leyen.
- The European Parliament is that the only directly elected EU body, with representatives apportioned by each member state's population. Unlike traditional legislatures, it can't propose legislation, but laws can't pass without its approval. It also negotiates and approves the EU budget and oversees the commission. Parliament is currently led by Italian politician David Sassoli.
- The Council of the EU, also referred to as the Council of Ministers to avoid confusion, may be a second branch whose approval is additionally needed for legislation to pass. This council consists of the govt ministers from all EU members, organized by policy area. as an example, all EU members' foreign ministers meet together in one group, their agriculture ministers in another, and so on.
- The Court of Justice of the ecu Union (CJEU) is that the EU's highest judicial authority, interpreting EU law and settling disputes. The CJEU consists of the EU Court of Justice, which clarifies EU law for national courts and rules on alleged member state violations, and therefore the General Court, which hears a broad range of cases brought by individuals and organizations against EU institutions.
- The European financial institution (ECB) manages the euro for the 19 countries that use the currency and implements the EU's monetary policy. It also helps regulate the EU banking industry. within the midst of the EU debt crisis, which rocked the continent beginning in 2009, ECB President Mario Draghi controversially committed the bank to acting as a lender of expedient to ailing eurozone economies. French politician Christine Lagarde, former head of the International Fund, took over from Draghi in 2019.
- The European Court of Auditors (ECA) audits the EU budget, checking that funds are properly spent and reporting any fraud to Parliament, the commission, and national governments **(Nareth, 2021)**

5. The European monetary Union (EMU)

The decision to establish an Economic and Monetary Union (EMU) was made during the European Council meeting in Maastricht, the Netherlands, in December 1991. This decision was subsequently formalized in the Treaty on European Union, commonly known as the Maastricht Treaty. EMU represents a significant advancement in the economic integration process of the EU, which commenced with its foundation in 1957.

Economic integration through EMU offers various advantages, including the leveraging of economies of scale, enhancing internal efficiency, and bolstering the overall resilience of the EU economy as well as those of individual member states. These benefits contribute to economic stability, heightened growth rates, and increased employment opportunities, directly benefiting EU citizens. (INGRAM, 1973)

In practical terms, EMU entails:

- Coordination of economic policy-making between Member States
- Coordination of fiscal policies, notably through limits on government debt and deficit
- An independent monetary policy run by the European Central Bank (ECB)
- Single rules and supervision of financial Institutions within the euro area
- The single currency and the euro area (Nareth, 2021)

Topic two The customs system in the European Union

1. The European Union Customs Union

The European Union Customs Union represents a collective of economies, characterized by the absence of internal trade barriers and the implementation of a shared external tariff. It encompasses all member states of the EU along with several neighboring countries, including EFTA nations such as Norway, Iceland, Liechtenstein, and Switzerland. Forming a pivotal component of the single market, the Customs Union serves a fundamental role originally outlined in the Treaty of Rome, which established the European Economic Community in 1958.

The smooth operation of the single market relies on the consistent application of standardized regulations at its external borders, facilitated by the Customs Union. Within this union, goods can circulate freely without being subject to customs duties, while a uniform external tariff is imposed on all goods entering the union. Notably, one outcome of this arrangement is that the EU negotiates international trade agreements as a unified entity, representing the interests of its members collectively. As the world's largest trading bloc, the EU holds significant influence in global trade, accounting for a substantial portion, approximately 20%, of both global imports and exports. Positioned as a key player within the World Trade Organization and actively engaged in numerous bilateral trade agreements, the EU stands as a leading force within the international trade system.

The EU has played a significant role in global trade liberalization negotiations, particularly in the ongoing Doha Development Round initiated in 2001 under the auspices of the WTO. These negotiations, aimed at reducing tariffs and eliminating other trade barriers, underscore the EU's commitment to fostering open and fair international trade. (marina kESNER-škREB, 2010)

While trade rules are multilateral, actual trade transactions occur bilaterally between buyers and sellers, exporters and importers. Recognizing this, the EU has not only participated in the Doha negotiations but has also established a network of bilateral trade agreements with various countries and regions worldwide.

The EU has forged partnership and cooperation agreements with neighboring countries in the Mediterranean basin, as well as with Russia and other former Soviet Union republics. Moreover, its trade policy is closely intertwined with its development agenda. Through initiatives such as the Generalized System of Preferences (GSP), the EU provides duty-free or reduced-rate access to its market for imports from most developing countries. Furthermore, exports from the world's 49 poorest countries, except for arms, enjoy duty-free entry into the EU.

In collaboration with its 78 partners in the Africa-Pacific-Caribbean (ACP) group, the EU has devised a trade and development strategy aimed at integrating these regions into the global economy. Additionally, the EU has pursued free trade agreements, such as with South Africa and negotiations for a similar deal with the Gulf Cooperation Council (GCC) countries.

While the EU lacks specific trade agreements with major developed trading partners like the United States and Japan, trade relations are managed through WTO mechanisms. However, the EU has numerous sector-specific agreements with these countries. Similarly, trade between the EU and China operates within the WTO framework, with China being the EU's second-largest trading partner after the United States. (marina kESNER-škREB, 2010)

2. The legal and organizational framework of the customs system of the European Union

The customs union, comprised of Member States, serves as the legal framework governing the customs system within the European Union. Established with the primary objective of unconditionally abolishing tariffs and customs duties that impede trade among Member States, it also establishes a common customs tariff for trade interactions with third countries. The formal inception of the customs union is recognized as July 1, 1968, built upon four

customs systems adopted by six founding countries: the Netherlands, Belgium, Luxembourg, France, Italy, and the Federal Republic of Germany.

The significance of the customs union was underscored in the Communication on developing the EU customs union and its governance. Since January 1, 2009, the Treaty on the Functioning of the European Union has provided the legal basis for the operation of the customs union. This treaty mandates an absolute prohibition on the imposition of customs duties on imports and exports, as well as charges that have an equivalent effect. Additionally, it prohibits quantitative restrictions on exports or imports among Member States and any measures that have a similar impact.

The customs system of the European Union is influenced directly by several key institutions, including the European Parliament, the Council of the European Union, the European Commission, the Court of Justice of the European Union, and the European Economic and Social Committee. These bodies collectively shape and oversee the implementation of customs policies within the EU. (Świerczyńska)

European Parliament
the role of a co-legislator of customs regulations. Customs issues are covered by the Internal Market and Consumer Protection (IMCO).
Council of the European Union
the role of a co-legislator of customs regulations and an author of recommendations, resolutions and other programme documents related to customs matters. Customs issues are the responsibility of: the Working Party on Customs Union – it deals with customs legislation, is responsible for facilitating common positions with international organizations (mainly WCO) as well as with third countries; the Customs Cooperation Working Party – its operations focus on collaboration of customs administrations in the area of combating customs regulations violations, issues related to controls of goods transited via the external EU borders, as well as conducting joint customs operations. Furthermore, customs matters also lie within the competence of the Indirect Taxation Subgroup – as regards the excise tax, and the Expert Group on Gambling Services – in the area of gambling. Customs issues, particularly with regard to customs cooperation, are also examined by working parties dealing with police collaboration (the Working Party on Frontiers, on Terrorism, for Schengen Matters).
European Commission
XXI Commission Directorate-General 'Taxation and Customs Union' (DG TAXUD) is responsible for administering the customs union and the functioning of customs systems of particular Member States. The mission of the Directorate is the customs union governance and the development of the EU in the area of customs tariffs and taxes. Its activities focus on: simplifying and modernizing procedures and regulations; supporting Member States in the appropriate implementation of the Union customs regulations; governance and security of the external EU borders; combating illicit trade; strengthening the security and safety of the international supply chain as well as international cooperation. DG TAXUD's duty is to ensure that actions taken by customs administrations of Member States are consistent, coherent, non-discriminatory, regardless of where the goods enter or exit the EU customs territory. This body performs its tasks by means of five directorates, which include units specializing in particular areas of the Union customs and tax system.
Court of Justice of the European Union
acts as a stabilizer of the customs law – it shapes the judicature concerning the customs issues, which applies to all institutions (including customs administrations), economic operators and citizens.
European Economic and Social Committee
takes part in shaping the customs law and system by means of opinions on legislative proposals, already at the stage of preparing bills. The preparation of opinions on legislative acts concerning the customs union is the responsibility of the Section for Single Market, Production and Consumption (INT).

Table 3 : The role of the Community institutions in the shaping of the customs system

3. The customs systems in the European Union – priorities and challenges

The history of the European customs union reflects its successful adaptation to evolving challenges and expanding requirements, such as the enlargement of the European Union and changes in international business practices. Presently, the effective functioning of the customs system hinges on the proper implementation of regulations outlined in the Union Customs Code (UCC), which serves as the cornerstone of the EU customs framework. Adopted on October 9, 2013, the UCC came into force on October 30, 2013, with provisions being enforced gradually since May 1, 2016, and slated for full implementation by January 1, 2021.

The overarching goal of the UCC preamble is to streamline and standardize regulations, facilitate legitimate trade through straightforward procedures, support trustworthy economic entities, and ultimately transition all customs and trade transactions to electronic platforms. Achieving this objective requires uniformity in customs administration operations and effective cooperation among member states' authorities. The implementation challenge necessitates equivalence in outcomes across diverse geographical, budgetary, and organizational contexts.

In the coming years, efforts within the EU customs system will prioritize efficient management of goods clearance and controls, particularly through the development of high-quality, multi-faceted, and common risk management approaches, fundamental to customs operations. With the anticipated full implementation of UCC provisions in 2021, significant reductions in clearance times and enhancements in customs processing are expected, as the system transitions to a fully electronic environment.

Moreover, ensuring consistent enforcement of regulations is paramount, given the disparities in sanctions for customs law violations across member states. Therefore, standardizing categorization and levels of sanctions is crucial to safeguarding the financial interests of the EU. Enhancing cooperation among customs administrations and aligning with various EU policy areas are also key priorities, requiring the introduction of consistent quality standards and comprehensive training.

In addressing these challenges, customs administrations must implement coherent solutions that improve service quality while effectively combating customs and tax crimes to better safeguard trade in goods. (Świerczyńska)

Topic three Application of blockchain in customs in the European Union

1. Initiatives on blockchain at EU level

Policy initiatives

Since 2013, the European Union's Horizon 2020 program has been actively funding projects centered around blockchain technology. With approximately 770 blockchain initiatives operating at both EU and Member State levels, the Commission has demonstrated a strong commitment to advancing blockchain innovation. In February 2018, the European Commission's Directorate-General for Communications Networks, Content and Technology (DG CONNECT), in collaboration with the European Parliament, launched the EU Blockchain Observatory and Forum. This platform serves as a vital hub for stakeholders, facilitating engagement and knowledge exchange on blockchain-related matters.

The EU Blockchain Observatory and Forum play a crucial role in monitoring key initiatives across Europe, fostering connections between European and global expertise, and facilitating the dissemination of knowledge on blockchain technology. Notably, the observatory has published reports covering various aspects of blockchain, including scalability, operability, regulatory frameworks for smart contracts, and blockchain applications in trade finance and supply chains. Through these efforts, the EU aims to remain at the forefront of blockchain innovation and ensure its effective integration into various sectors of the economy.

In April 2018, a significant milestone was reached when 21 EU Member States, along with members of the European Economic Area such as Norway and Liechtenstein, collectively agreed to establish the European Blockchain Partnership (EBP). This declaration marks a unified commitment among the signatories to harness the potential of blockchain-based services at a political level. The primary objective of the declaration is to outline a policy agenda for blockchain, with a focus on critical regulatory aspects like smart contracts.

Furthermore, the EBP is actively engaged in developing the European Blockchain Services Infrastructure (EBSI). This infrastructure aims to facilitate the delivery of EU-wide cross-border public services through the utilization of blockchain technology. Since its inception, the EBP has garnered increased support, with additional countries joining the Partnership. As a result, the total number of signatories has now reached 30, reflecting growing momentum and collaboration in advancing blockchain initiatives across Europe.

The European Blockchain Services Infrastructure (EBSI) supports four key use cases: notarisation, diplomas, European self-sovereign identity, and trusted data sharing. Of particular relevance to trade and supply chains is the trusted data sharing use case, which aims to utilize blockchain technology to securely exchange data among customs and tax authorities within the EU.

EBSI was integrated into the Connecting Europe Facility in 2020, serving as a foundational element by providing reusable software, specifications, and services to facilitate adoption by EU and Member State public administrations. Looking ahead, the European Blockchain

Partnership (EBP) plans to select additional use cases for integration in 2021. Proposed ideas include developing a use case related to supply chain management, with a focus on provenance. Furthermore, sustainability and the role of information and communication technology (ICT) in achieving the objectives of the Green Deal are areas of interest for future integration.

The Digital Europe Programme is slated to drive the continued development and deployment of EBSI in the next Multiannual Financial Framework, emphasizing the importance of deployment and implementation in advancing blockchain initiatives across Europe.

Another notable initiative supported by the EU is the establishment of the International Association for Trusted Blockchain Applications (INATBA) in April 2019. Serving as a multi-stakeholder organization, INATBA functions as a global forum that brings together developers and users of distributed ledger technology (DLT) with regulators and policymakers from around the world. Additionally, in November 2019, the Commission, in collaboration with INATBA, the EU Blockchain Observatory and Forum, and the non-profit association Alastria, organized the 'Convergence Global Blockchain Congress.' This conference provided a platform for industry and regulatory stakeholders to convene, assess the current state of blockchain technology, and exchange insights.

Furthermore, the Commission is actively involved in initiatives aimed at promoting the legal and regulatory aspects of blockchain-inspired technologies. For instance, efforts are underway to enhance legal certainty in two key areas related to blockchain: smart contracts and tokenization. In the case of smart contracts, there is a need to clarify mutual recognition across borders. Similarly, the use of tokens as a form of digital currency in the economy requires clarification. Additionally, the Commission is exploring the application of blockchain for digital identity implementation, including its connection to eSignatures and eSeals, under the eIDAS regulation. While these endeavors are less directly relevant to trade and supply chains, they contribute to creating a conducive regulatory environment for blockchain technology adoption and innovation. (Nikita Vlasov, 2020)

Legislation

Between 2017 and 2018, the European Parliament passed several non-legislative resolutions addressing the application of blockchain technology across various sectors. Notably, the 2018 Resolution on 'Blockchain: A Forward-Looking Trade Policy' focused on the potential impacts of blockchain on the EU's international trade strategy. The resolution specifically examines the use of permissioned blockchains, which require authorization for access.

The primary objective of the resolution is to identify current inefficiencies within supply chains, EU trade, and customs procedures, and to explore the potential benefits of widespread blockchain adoption. It aims to recommend strategic measures to the European Commission and Member States for leveraging blockchain technology effectively. To achieve this, the resolution delves into various aspects, including blockchain's characteristics concerning EU trade policy, customs and trade facilitation, cross-border data flows and data protection, SMEs, and interoperability and scalability in conjunction with related technologies.

Subsequently, the European Commission responded to these recommendations with a report adopted in June 2019. The response addresses the key points raised by the European

Parliament and outlines measures to address the challenges and harness the opportunities presented by blockchain technology in the context of EU trade policy. (Nikita Vlasov, 2020)

- Responses of the European Commission to the 2018 resolution

Theme	The European Parliament recommends:	The European Commission:
General	**Following developments on ongoing pilots/ initiatives in the international supply chain and external aspects of customs.** **Developing a set of guiding principles for blockchain applications to international trade, in order to provide industry and customs and authorities with sufficient legal certainty.** **Simplifying and enhancing the flow of information related to trade facilitation by adopting suitable communication technologies** **Looking into how blockchain in trade could support the realisation of Sustainable Development Goals.**	**Will continue to build on existing work. In 2018 the European Blockchain Partnership (EBP) was created, committed to establish the European Blockchain Services Infrastructure (EBSI), supporting the delivery of cross-border digital public services.** **Is reluctant to set up a new advisory group with a proliferation of such groups and projects in this area.**
Customs and trade facilitation	**Maintaining and strengthening the WTO and its commitment to a rules-based trading system in order to ensure a le vel playing field and enforce global trade rules as regards the Trade Facilitation Agreement.**	**Has been looking into the potential application of blockchain solutions for a number of trade-related aspects (excise duties, customs logistics, and traceability) through DG TAXUD.** **Has proposed (by DG TAXUD) a use case (System of Exchange of Excise Data – SEED) which has been prioritised by the EBP.**
Cross-border data flows and data protection	**Calling for provisions allowing for digital ecosystems and cross-border data flows in FTAs.** **Inviting the European Data Protection Board to issue guidelines and recommendations to ensure that technology is compliant with EU law.**	**Acknowledges the importance of simplifying and enhancing the flow of information related to trade facilitation and recognises the potential role of blockchain in this area.** **Recognises the need to ensure adequate data privacy. It is for this reason there has been a report from the European Blockchain Observatory (EBO) that specifically deals with blockchain and the GDPR, which found no fundamental issues that made blockchain non-compliant**

		with GDPR.
SMEs	**Recognising the need to ensure that the development of blockchain in international trade includes SMEs.**	**Nothing specific mentioned.**
Interoperability, scalability and interactions with related technologies	**Enhancing collaboration with ISO and other relevant standardisation bodies** **Further research into the applicability of blockchain technologies to the digital transformation and automation of international trade, in particular under the Digital Europe Programme.** **Assessing whether blockchain offers better solutions to existing technologies to deal with challenges in EU trade policy**	**The Commission organised a workshop on blockchain with ETSI in June 2018, and established a liaison with the newly established Industry Specifications Group on permissioned distributed ledgers. It has established a liaison with ISO Technical Committee 307 and collaborates with CEN, which has set up a technical committee on blockchain to develop EU standards for EU law compliant reference implementations** **The EBO is liaising with the relevant stakeholders on an ongoing basis – an activity it hopes to continue and expand upon. Over 1500 stakeholders have joined the EBO working groups and forum. Interoperability between blockchain systems is a major focus in these discussions, but also scalability, sustainability, how to set up an eIDAS compliant blockchain implementation, and what the legal obstacles for blockchain systems deployment are.**
Cooperation with Member States or International Organisations	**Producing a horizontal strategy document involving relevant DGs on adoption blockchain technologies in trade-Set up an advisory group within DG Trade on blockchain** **Working with Member States to launch and supervise pilot projects in order to test its benefits.** **Collaborating with international organisations and feeding into current initiatives.**	**Acknowledges its potential to become a leading actor in the field of blockchain and international trade, and looks forward to cooperating with a wide range of partners – both in the public and private sector, at an international and national level – to ensure this is the case.** **Is working closely with the Member States, through the EBP and a broad set of stakeholders through the EBO.**

Table 4 : Responses of the European Commission to the 2018 resolution

Source : Blockchain for supply chains and international trade (Euopean Parliament)

2. Proof of concept of blockchain from the presprective of customs

From the perspective of customs, DG TAXUD (Director General for Taxation) has developed several proofs of concept (PoC). The first PoC was developed in collaboration with the ICC to test the potential benefits of blockchain's application to the notarisation and transaction of ATA carnets in digital format. The PoC was successfully concluded in mid-2018 demonstrating that blockchain technology could be used to ensure the integrity and traceability of ATA carnets. A second PoC tested the possibility to simplify a complex trans-European systems, such as excise goods movement monitoring in real-time by replacing the Excise Movement and Control System with a blockchain platform, A second PoC tested the possibility to simplify a complex trans-European systems, such as excise goods movement monitoring in real-time by replacing the Excise Movement and Control System with a blockchain platform, , in order to exchange information between custom authorities in Europe. The test showed significant efficiency gains, but also that challenges related to confidentiality and security remain. A third PoC is currently being implemented. It focuses on the potential use of blockchain technology for electronic registries on economic operators to replace the current centrally managed database. (Nikita Vlasov, 2020)

3. Policy options of customs

Parliament may suggest that the European Commission facilitates collaboration among EU customs authorities seeking to leverage distributed ledger technology for custom digitization. This could involve jointly developing additional proofs of concept to explore the potential benefits and feasibility of blockchain implementation.

Existing EU single window working groups could be encouraged to evaluate blockchain-related considerations outlined in guidelines developed by the World Economic Forum. Through consultations with relevant stakeholders such as authorities, private sector entities, and mixed focus groups, these groups could assess whether there is a viable business case for blockchain adoption within their respective domains.

Furthermore, the European Commission could be prompted to engage with partners in mutual recognition agreements to investigate the feasibility of implementing a blockchain-based solution for sharing authorized economic operator information. Such collaboration could enhance efficiency and transparency in customs procedures while promoting interoperability among participating entities. (Parliament, 2020)

4. Customs facilitation through blockchain

'With the blockchain technology, Customs administrations and other border agencies would significantly improve their capacity for risk analysis and targeting, thus contributing to improved trade facilitation' - Yotaro Okazaki, World Customs Organisation

Indeed, many of the most cumbersome document verification processes in international trade are concentrated within customs procedures. Therefore, collaborating with customs authorities appears to be one of the most promising applications of blockchain technology in trade. This is primarily due to the potential benefits of reducing import processing timelines, enhancing transparency, and streamlining data management.

Customs authorities are accustomed to operating on an international scale and are familiar with the need to standardize processes across borders. As a result, they may be more receptive to implementing large-scale distributed ledger technology (DLT) solutions compared to other stakeholders. The inherent international nature of customs operations lowers the threshold for adopting DLT solutions, making customs a particularly conducive environment for exploring blockchain applications in trade. (Nikita Vlasov, 2020)

Figure 14 : Digital approaches to customs, from most globally adopted to least

Efforts to enhance customs efficiency begin with the transition to digital customs, which has been a primary focus of the EU's Customs Union. The Union Customs Code (UCC), implemented in 2016, advocates for a paperless, fully electronic, and interoperable customs environment. The UCC prioritizes simplicity, service, and speed in customs procedures, aligning with the goal of streamlining operations.

In line with this commitment, the Electronic Customs Multi-Annual Strategic Plan for Customs of 2019 emphasizes the importance of digitalization in customs processes. This strategic plan reinforces the EU's dedication to leveraging technology to improve customs efficiency and effectiveness.

A research paper published by the World Customs Organization (WCO) in 2018 identified blockchain technology as holding significant potential in customs operations. The paper highlights blockchain's ability to facilitate the collection of accurate data, automatically detect fraud, and streamline the collection of taxes and duties. As part of its conclusions, the WCO recommends that its members continue to explore the potential of blockchain technology while addressing existing legal and technical constraints. This underscores the importance of ongoing research and innovation in harnessing blockchain for customs modernization. (Nikita Vlasov, 2020)

The importance of standardized information and documents, accessible through a single entry point to fulfill import, export, and transit-related regulatory requirements, has been recognized

at both global and EU levels. The EU Customs Single Window initiative exemplifies this recognition by enabling economic operators to electronically submit all necessary information required by customs and non-customs legislation for cross-border movements of goods within the EU. The initiative launched its first pilot in 2014 and has since garnered significant support from the European Commission.

The European Commission has remained committed to advancing the EU Customs Single Window initiative, with a pilot currently operational in nine Member States. Additionally, an approved business case for a new project and a working group dedicated to developing a legal framework to implement the EU Single Window further underscore this commitment.

DG TAXUD has conducted two proof of concepts (PoCs) that demonstrate the practical potential of blockchain technology in customs procedures. One PoC focused on using blockchain to facilitate and monitor the real-time movement of 'excise goods,' while the other explored the feasibility of a notarization service for an international customs document (ATA carnet) in collaboration with the International Chamber of Commerce (ICC). Although DG TAXUD does not intend to pursue operational projects based on these PoCs, their success suggests promising prospects for the deployment of solutions aimed at standardizing customs documents and procedures.

While DG TAXUD may not proceed with operationalizing these PoCs, other stakeholders interested in digitizing customs procedures may choose to explore and implement similar solutions based on the insights gained from these successful demonstrations. (Nikita Vlasov, 2020)

- ***The European Parliament could recommend that the European Commission act as a facilitator for EU customs authorities interested in employing DLT for the digitisation of custom to jointly develop further Proofs of Concept***

Mobilizing National Customs Authorities around blockchain as a solution for concerns related to the ATA carnet could offer a solution that has been collaboratively developed across multiple stakeholders, addressing trust issues that may have hindered adoption of other solutions. By leveraging blockchain technology, which inherently offers transparency, immutability, and enhanced security, Customs Authorities may find a more trustworthy and efficient solution for managing ATA carnets.

Furthermore, the ongoing efforts to establish the EU Single Window environment provide an ideal platform for further exploration of Distributed Ledger Technology (DLT)-based solutions. The EU Single Window Customs 2020 Project Group, established in 2016, is already studying frameworks to develop the EU Single Window environment for customs. This initiative presents an opportunity to integrate blockchain technology into the EU Single Window infrastructure, potentially streamlining customs procedures and enhancing data security and integrity.

Guidelines for operationalizing blockchain use cases in Single Windows have already been developed by the World Economic Forum (WEF). These guidelines offer a roadmap for implementing blockchain solutions in customs environments, covering aspects such as establishing a common vision and business case, building the technology architecture, and measuring impact. By following these guidelines and leveraging existing collaborative efforts,

Customs Authorities can explore and implement blockchain-based solutions within the EU Single Window framework, potentially revolutionizing customs procedures across Europe.

- ***The European Parliament could recommend that established EU Single Window working groups run through the blockchain key questions to be addressed within the guidelines developed by the WEF through consultations with authorities, private sector groups and mixed focus groups to explore whether there is a business case for its development.***

Discussions surrounding the adoption of Distributed Ledger Technology (DLT) in customs procedures should primarily focus on the specific value added by DLT in terms of border clearance. While other issues such as standardization, efficiency, and data sharing can be addressed through digital processes and programs, DLT offers unique benefits related to trust, transparency, and security that can significantly enhance border clearance processes.

The EU has established several Mutual Recognition Agreements (MRAs) with key partners, with ongoing negotiations with others. As partners like China and the USA begin to implement their own DLT-based solutions for border clearance, there is an opportunity for collaboration on implementing MRAs through blockchain technology. By leveraging DLT, MRAs can facilitate automatic and secure sharing of information on Authorized Economic Operators (AEOs), thereby streamlining customs procedures and enhancing trade facilitation.

The Inter-American Development Bank (IADB) is actively supporting the development of a DLT solution for sharing information on AEOs. This initiative demonstrates the potential for DLT to revolutionize customs processes by enabling secure and efficient information sharing among relevant stakeholders. Collaborative efforts such as these underscore the importance of leveraging blockchain technology to modernize customs procedures and facilitate international trade. (Nikita Vlasov, 2020)

- ***The European Parliament could recommend that the European Commission look to its partners in Mutual Recognition Agreements to explore the possibility of a blockchain-based solution on sharing Authorised Economic Operator information.***

<u>Other Customs facilitation through blockchain</u>

1. The European Commission could act as a bridge between EU customs authorities interested in employing blockchain technology for the digitalisation of customs, with a view to jointly developing further proofs of concept.
2. EU Single Window working groups could run through the blockchain key questions to be addressed within the guidelines developed by the World Economic Forum by means of consultations with authorities, private sector groups and mixed focus groups, to explore whether there is a business case for its development.
3. The European Commission could look to its partners in mutual recognition agreements to explore the possibility of sharing Authorised Economic Operator information via blockchain. (Parliament, 2020)

Topic four Case study : EU-Turkey union

1. History of the formation of customs union between Turkey and the European Union

Following the aftermath of World War II, numerous organizations emerged, primarily aimed at fostering global peace and stability. These entities, such as NATO, the UN, the OECD, and others, weren't solely driven by military considerations but also sought to address economic, political, and social concerns.

Turkey, as one of the founding members of the UN and a participant in NATO, the Council of Europe, and the OECD, has stood as a steadfast ally of the Western world post-World War II. Taking inspiration from the West, Turkey initiated a process of modernization in the 19th century, modeling its secular framework after Western European principles.

By closely aligning with Western Europe politically, Turkey naturally extended this partnership into economic realms. Consequently, Turkey sought close collaboration with the emerging European Economic Community (EEC) in 1959, initially applying for membership, albeit unsuccessfully.

The pivotal moment came with the signing of the Ankara Agreement between Turkey and the EEC in 1963. This agreement outlined the framework for establishing a customs union, viewed as a stepping stone towards full integration with the Community. Despite facing initial setbacks, Turkey's persistent efforts led to the establishment of the customs union in 1995, marking a significant milestone towards its ultimate goal of full membership and integration into the European Community. (Nas Çiğdem)

Formation of Customs Union Between Turkey And The EU

Discussions commenced in 1994 and reached a conclusion on 6 March 1995 during the Turkey-EU Association Council meeting, comprising the Foreign Ministers of Turkey and the EU Member States. On this day, the Association Council adopted Decision 1/95, signaling the finalization of the Customs Union between Turkey and the EU concerning industrial and processed agricultural goods by 31 December 1995.

Decision No 1/95 mandated the elimination of customs duties and quantitative restrictions, alignment of customs law, mutual assistance in customs matters, and Turkey's convergence with the Community common customs tariff.

Following the establishment of the customs union, Turkey removed all duties and equivalent charges on imports of industrial goods from the EU. Additionally, Turkey has been aligning its tariffs and charges on industrial goods imports from third countries with the EU's Common External Tariff. This adjustment process is anticipated to conclude within five years.

These measures have led to a significant reduction in Turkey's weighted rates of protection for industrial product imports from EU and EFTA member states, dropping from 5.9% to 0%. Similarly, for goods originating in third countries, rates decreased from 10.8% to 6%. Further

reductions are expected, with rates projected to decrease to 3.5% once the EU fulfills its obligations under WTO negotiations.

While basic agricultural products were initially excluded from the arrangement, a preferential trade regime for these products was established on 1 January 1998. Continued efforts are underway in this direction, with Turkey progressively adopting aspects of the EU's Common Agricultural Policy. Conversely, under the Customs Union Decision, the EU is expected to consider Turkey's agricultural interests when shaping its agricultural policy.

The culminating phase of the European Community (EC) and Turkey's relationship under the Ankara Association Agreement of 1963 aimed to establish the EC-Turkey Customs Union. This milestone was reached on 1 July 1996. However, the scope of this customs union, which hinges on the status of goods in free circulation, is limited to industrial products and processed agricultural products. Notably, it does not encompass:

- agricultural products, as defined in Annex I of the Amsterdam Treaty;

- coal and steel products

These two categories are subject only to preferential agreements based on their originating status.

The customs union between Turkey and the EU constitutes a very important cornerstone regarding Turkey’s integration within the European Union. It is the biggest step towards Turkey’s ultimate goal of membership with the EU. However, it also is the most important economic integration Turkey has with a trading bloc as great as the EU that is also Turkey’s major trade partner. Thereof, in the following chapter we examine the effects of Customs Union on Turkey’s economy (PALA, 2011)

2. Advantages and disadvantages of the EU-Turkey Customs Union

The advantages and disadvantages of customs unions can be analyzed through both static and dynamic effects:

Static Effects:

1. Trade Creation: This effect occurs when the formation of a customs union leads to cheaper imports from member countries replacing expensive domestic production. As a result, consumers benefit from lower prices and increased choices, leading to enhanced welfare.

2. Trade Diversion: This effect arises when expensive domestic production replaces cheaper imports from non-member countries due to the imposition of tariffs within the customs union. This can lead to inefficiencies and higher costs for consumers, resulting in a negative impact on welfare.

Dynamic Effects:

1. Liberalization: Customs unions can serve as a step towards the liberalization of territorial commerce, promoting increased trade and economic integration among member countries.

2. Protectionism: However, customs unions may also lead to protectionist measures against non-member countries, reducing trade with external partners and potentially harming global welfare.

3. Economic and Technological Changes: Over time, economic and technological structures evolve, leading to changes in the static effects of customs unions. Therefore, the overall impact on welfare may fluctuate based on these dynamic factors.

In summary, while customs unions can lead to trade creation and liberalization, they may also result in trade diversion and protectionism. The net effect on welfare depends on the balance between these factors and the changing economic and technological landscape.

The dynamic effects of customs unions can be categorized into dynamic advantages and dynamic disadvantages, with the primary goal being to realize dynamic advantages. Key dynamic advantages of customs unions include:

1. Increase in External Competition: Customs unions can stimulate greater competition from external markets, encouraging member countries to enhance their productivity and efficiency to remain competitive.

2. Economies of Scale: By creating a larger market through integration, customs unions enable firms to achieve economies of scale in production, distribution, and marketing. This can lead to cost efficiencies and lower prices for consumers.

3. Rise in Foreign Currency Reserves: Increased trade and investment within the customs union can result in a rise in foreign currency reserves for member countries, enhancing their financial stability and economic resilience.

4. Encouragement of Investments: Customs unions create a more attractive investment environment by providing a larger market and greater regulatory coherence. This can attract both domestic and foreign investments, fostering economic growth and development.

5. Acceleration of Industrialization: Customs unions can accelerate the process of industrialization by promoting specialization, technology transfer, and the development of manufacturing sectors. This can lead to higher levels of employment and income growth.

> Overall, the dynamic advantages of customs unions aim to promote economic growth, competitiveness, and prosperity among member countries. (Uğur ÖZGÖKER, 2020)

The dynamic disadvantages of customs union can be classified into four;

1. Development differences between member countries of customs union can lead to movements of production factors from relatively less developed countries to developed countries. The most important reason for this is that marginal returns of production factors are higher than developed countries.

2. Customs union can increase the oligopoly market. Cooperation among companies of developed countries can produce the oligopoly structure and high prices to consumers.
3. Customs union can grow the scale of companies and in this way, huge scale production companies lead to extreme bureaucratic and inactive structures.
4. Administrative costs of a customs union can be high

Advantages of the Customs Union were classified into five by the European Commission in the Study of the EU-Turkey Bilateral Preferential Trade Framework (BPTF), Including the Customs Union (CU), and an Assessment of Its Possible Enhancement Final Report 26 October 2016:

‘’While the BPTF generated significant benefits for both the EU and Turkey, it could have still been more beneficial:

- Fistly , During the Bilateral Preferential Trade Framework (BPTF) period, Turkey's commercial policy, shaped by the requirements of the Customs Union (CU) with the European Union (EU), was found to be suboptimal for Turkey's needs. While Turkey's unilateral liberalization with the EU's Free Trade Agreement (FTA) partners was beneficial, achieving reciprocal concessions and acknowledgment of Turkish-origin goods within the EU's FTAs would have been more advantageous. Although some EU agreements included provisions for diagonal cumulation, they were not consistently applied. Formal mechanisms to address Turkey's concerns in the EU's commercial policy formulation could have improved commercial relations.
- Secondly, The omission of services from the Bilateral Preferential Trade Framework (BPTF) resulted in the bilateral relationship being regulated by the commitments of the World Trade Organization (WTO) General Agreement on Tariffs and Trade (GATS). Turkey excelled in service sectors where it had made substantial commitments under the GATS during the BPTF period. However, in sectors with limited openness, such as business and professional services, Turkey's export performance was lacking. While the deep liberalization of goods sectors under the BPTF did not contribute to this underperformance, the failure to leverage GATS commitments to open up Turkey's closed services sectors was a missed opportunity.
- Thirdly, Turkey's decision to maintain higher and broader protection for primary agriculture within the Bilateral Preferential Trade Framework (BPTF) led to a corresponding decrease in structural adjustment toward a more efficient economy. As a result, the potential gains that could have been achieved were diminished.
- Fouthly, Various obstacles emerged or became evident during the expansion of bilateral trade under the Bilateral Preferential Trade Framework (BPTF), hindering the full realization of the potential benefits of the Customs Union (CU). These obstacles included Turkey's introduction of new Non-Tariff Barriers (NTBs) that hindered EU goods sector export interests, as well as the absence of a services component within the BPTF. This absence hindered the facilitation of cross-border value chains and production networks that developed under the BPTF.
- Finally, The institutional framework of the Bilateral Preferential Trade Framework (BPTF) was found to be insufficient in adequately addressing the challenges that arose due to the extensive integration facilitated by the Customs Union (CU). This inadequacy was particularly evident in areas such as dispute resolution and ensuring coordination in the development of commercial regulations. (Uğur ÖZGÖKER, 2020)

The table below shows that the Customs Union among Turkey and the EU maintained some benefits but in the crises, the effects of the Customs Union reduced.

	EU	Turkey
Real GDP (%)	0.008	0.722
Household Income (EUR billions at 2016 prices)	1.6	7.5
Bilateral Exports (EUR billions at 2016 prices)	8.7	6.0
Real Growth in Total Exports (%)	0.029	1.28
Real Growth in Total Imports (%)	0.029	2.60

Table 5 :Main effects of BPTF on the EU and Turkey
Source : Study of the EU-Turkey Bilateral Preferential Trade Framework Including the Customs Union and an Assessment of Its Possible Enhancement Final Report of 26th October 2016

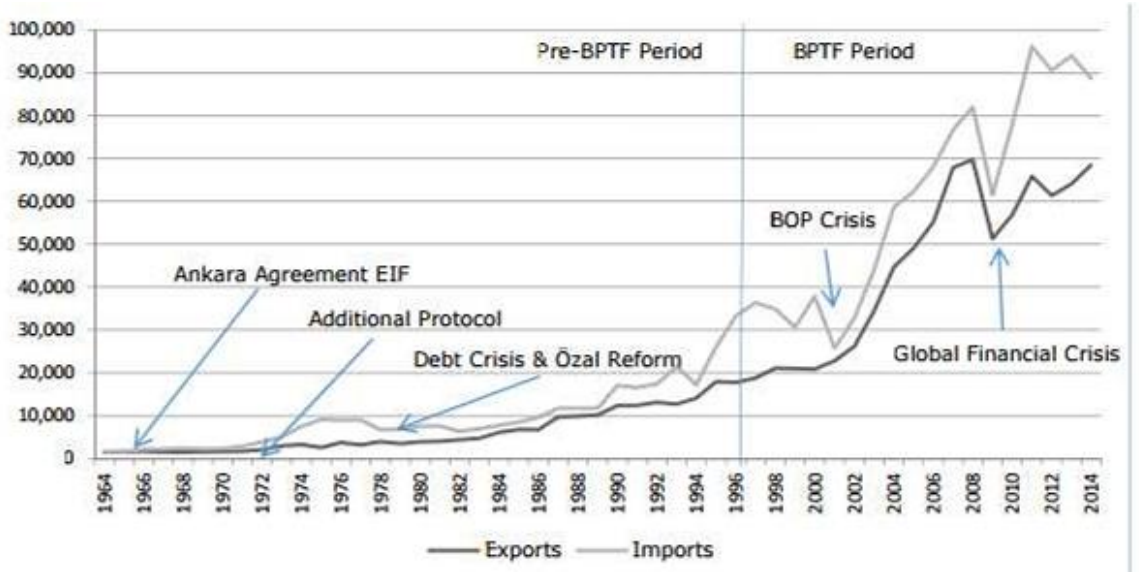

Figure 15 : Turkey's Bilateral Trade with the EU since the Ankara Agreement

Source : Study of the EU-Turkey Bilateral Preferential Trade Framework Including the Customs Union and an Assessment of Its Possible Enhancement Final Report of 26th October 2016

Criticism and discontent are arising from Turkey regarding the Customs Union. The growing trade deficit with the EU, insufficient economic assistance, crises in production industries, and the EU's dependence on external trade are fueling Euroscepticism. The implementation of the Customs Union is perceived as detrimental to Turkey's interests due to the lack of recognition of equal status and interests, leading to an asymmetrical agreement that is not mutually beneficial. Additionally, the EU's approach is perceived as zero-sum, where its gains are seen as Turkey's losses.

The outcomes of the Customs Union demonstrate that Turkey has conflated tools and objectives. While the aim is to enhance economic relations with the EU, reliance on the

unilateral decisions of the EU is deemed problematic. The shortcomings of the Customs Union include:

1. Turkey lacks veto authority and must adhere to EU decisions regarding the external economic relations of the Customs Union.

2. Despite assuming full membership responsibilities, Turkey lacks participation in decision-making mechanisms.

3. Turkey is unable to impose sanctions on the EU if it fails to fulfill its obligations under the agreement. For example, in 1996, when the EU withheld economic aid from Turkey, Turkey had no recourse.

4. Turkey's position within the Customs Union resembles that of a third country or a non-EU member. For instance, in 1996, when the EU initiated anti-dumping measures against various countries, Turkey, as part of the Customs Union, was affected.

5. While EU member states impose restrictions, taxes, and barriers, Turkey, as part of the Customs Union, must comply with these decisions without the ability to take initiative. Consequently, Turkey's external trade and relations with other countries have been negatively impacted. (Uğur ÖZGÖKER, 2020)

3. Blockchain-Related Developments in Turkey

Blockchain Turkey Platform

The Blockchain Turkey Platform (BCTR) was founded in 2018 by the Turkish Informatics Foundation with the primary goal of positioning Turkey as a leader in blockchain technology within its region. BCTR conducts various activities to raise awareness about blockchain, including organizing events, educational programs, and publishing reports on blockchain technology. Currently, BCTR boasts 67 memberships and 20 collaborations, encompassing a diverse range of public institutions, private companies, and universities. Through its collaborations, BCTR aims to foster a robust blockchain ecosystem in Turkey.

TUBITAK Blockchain Research Laboratory (BZLab)

TÜBİTAK, short for the Scientific and Technological Research Council of Turkey, is dedicated to advancing science, technology, and research initiatives. Among its various research centers and institutions is the National Research Institute of Electronics and Cryptology, which houses the Blockchain Research Laboratory. Established in 2017, this lab focuses on conducting research projects and providing accurate knowledge about blockchain technology. It stays updated on current literature, conducts studies, and hosts workshops to increase the adoption of blockchain technology across different sectors and support related trials.

Creating A National Blockchain Infrastructure

In 2019, the Ministry of Industry and Technology released the "Industry and Technology Strategy 2023" report, outlining the goal of establishing a National Blockchain Infrastructure. This objective is part of the broader infrastructure component within the strategy, with blockchain highlighted as a key area. The Ministry aims to encourage the development of this infrastructure by initially identifying appropriate public services, such as land registry, diploma, and customs services, for pilot blockchain implementation cases. Following the trial phase, the Ministry plans to establish a "regulatory sandbox," providing a safe environment for successful trials to operate.

The 11th Development Plan 2019-2023

The incorporation of blockchain technology and associated initiatives was initially outlined in Turkey's 11th Development Plan, crafted by the Department of Strategy and Budget. The plan emphasized the commitment to invest in essential blockchain infrastructure components such as power grids, power stations, hardware, and software. Priority was designated to areas like customs services and transportation for blockchain implementation. Alongside future strategies and infrastructure investments, the plan also included provisions for the introduction of a Central Bank Digital Currency.

Ministry of Trade of Turkey

In 2019, the Ministry of Trade took a significant step by establishing its inaugural blockchain unit within the ministry. This move was prompted by the recognition that while the private sector advances with new technologies, key public institutions like the ministry should not lag behind. Initially, the focus of the blockchain unit will be on import and export applications. To leverage international expertise and successful case studies, the ministry entered into a service procurement contract with ATEZ, a software technology company. Additionally, the ministry became the first public institution to join the Blockchain Turkey Platform, indicating its commitment to fostering collaboration and innovation in blockchain technology.

Laws and Regulations Related to Blockchain

In Turkey, blockchain technology regulations are still in early stages, with focus primarily on discussions surrounding financial markets due to the technology's emergence in that sector and significant cryptocurrency use. While initial reports conveyed optimism, authorities adopted a cautious approach. Plans to regulate cryptocurrency markets emerged, and research on Central Bank Digital Currency (CBDC) was conducted. However, negative experiences, including market crashes and fraudulent incidents, led to regulatory measures. Turkey ultimately banned cryptocurrency usage for payments due to concerns about illegal activities, market speculation, and lack of central control mechanisms. (PEKDEMİR, 2021)

4. Effects of Blockchain on Customs

Utilizing blockchain technology in customs operations offers various benefits, including enhanced data management and monitoring capabilities. By integrating blockchain into customs processes, authorities can achieve data-driven customs operations, streamline trade processes, expedite customs clearance procedures, and strengthen security measures. Additionally, blockchain can aid in combating illegal trade activities, preventing tax fraud, and reducing evasion attempts.

Digitalization of Documents Presented to Customs

Customs clearance in international trade involves collecting documents from various parties, including chambers of commerce, inspecting authorities, logistics companies, insurance providers, and certification entities. In Turkey, the number of documents used during export procedures can reach up to approximately 200. Given the high volume of daily trade and the numerous documents associated with customs declarations, the burden on customs for document control is significant. Therefore, digitalizing these documents is essential for efficient monitoring, storage, and control. The figure below illustrates the basic and most common documents used in international trade.

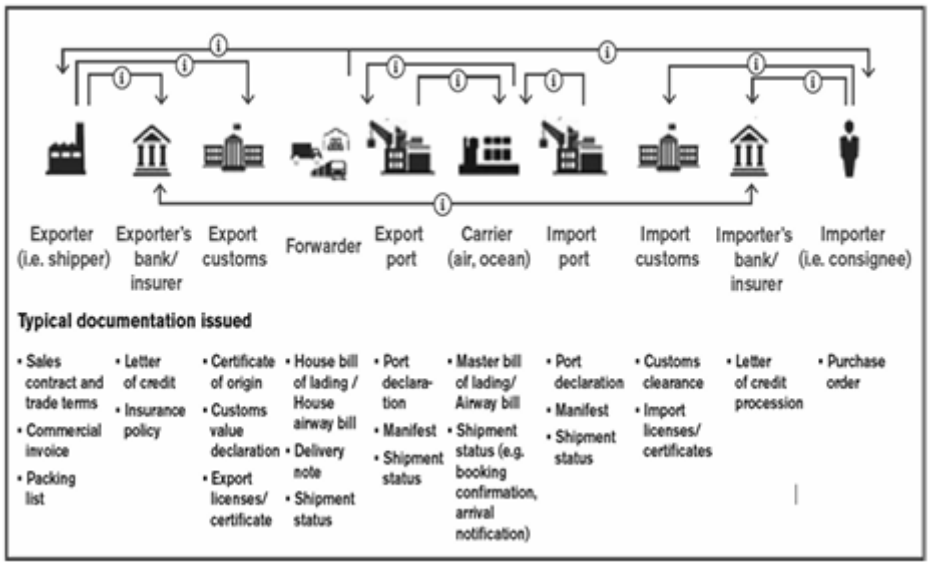

Figure 16 : Basic Documents in International Trade

Faster Customs Clearance

Blockchain technology offers a solution for digitizing customs documents and streamlining the customs clearance process, as well as the entire international trade flow. By connecting all relevant parties involved in international trade, such as ports, terminals, customs authorities, exporters, and logistics providers, through blockchain, costs can be reduced and efficiency increased. Given that customs processes require government-level actions, finding cheaper, faster, more secure, and efficient ways of conducting business is critical for the economy. In

the future, blockchain-powered paperless trade ecosystems will enable faster and more efficient customs procedures. The figure below illustrates an example of this ecosystem view.

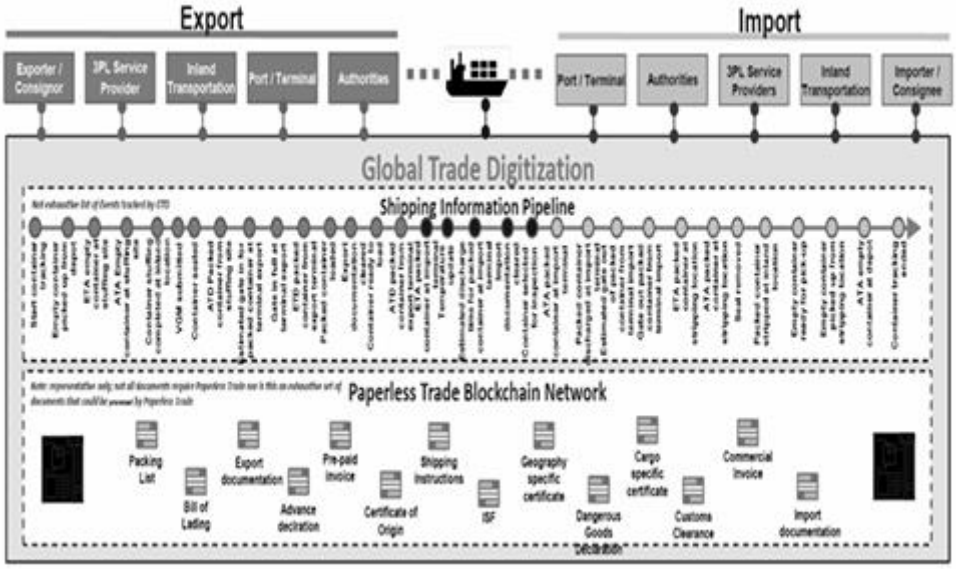

Figure 16 : Blockchain Enabled Paperless Trade

In this blockchain ecosystem, customs authorities can access relevant information such as insurance details, bill of lading, price, quantity, carrier information, etc., in real-time even before customs clearance. This enables customs authorities to have a clearer picture of international trade and allocate resources more effectively by assessing risks during customs clearance.

Another potential benefit of blockchain for customs is the use of smart contracts to alert related parties based on predefined conditions and automate the payment of duties. Currently, importers are billed after the entry of goods, but blockchain can change this by automatically triggering the payment of customs duties using smart contracts during the entry of goods. If the payment is not made for any reason during this process (e.g., insufficient funds in the bank account), the smart contract would automatically block the entry. This option has the potential to significantly accelerate customs procedures and customs clearance.

Combatting Illegal Trade

Blockchain technology holds significant promise for enhancing customs procedures and combating illegal trade. By digitizing customs documents and creating a transparent, immutable record of trade transactions, blockchain can streamline customs clearance processes and improve efficiency throughout international trade flows. Moreover, blockchain-based platforms enable customs authorities to access real-time information, aiding in risk evaluation and resource allocation during customs clearance. Additionally, blockchain facilitates the detection of illegal trade activities by providing a comprehensive record of transactions and enabling the identification of red flag indicators such as undervaluation or overvaluation of goods. Leveraging trade statistics, unit price analysis, and cross-referencing with financial transactions further strengthens customs' ability to detect and combat illegal trade. Overall, blockchain technology offers a powerful tool for enhancing customs operations and addressing the challenges posed by illegal trade.

Preventing Tax Fraud and Evasion

Governments are increasingly exploring blockchain technology's potential in taxation to address issues like tax fraud and evasion. The European Commission reported a substantial VAT gap of 160 billion euros in 2014, highlighting the urgency of effective tax management. Blockchain's self-executing smart contracts offer an innovative solution by automating tax remittance and securely storing payment data, reducing opportunities for fraud. Countries like the United Arab Emirates are prioritizing tax systems to prevent double tax payments, while the UK's HMRC plans to introduce a digital tax system. For customs authorities, blockchain enhances traceability and transparency by enabling real-time information exchange among exporters, importers, customs authorities, and other stakeholders, thereby aiding in the detection of tax fraud, errors, and evasions. (Selçuk Balı, 2022)

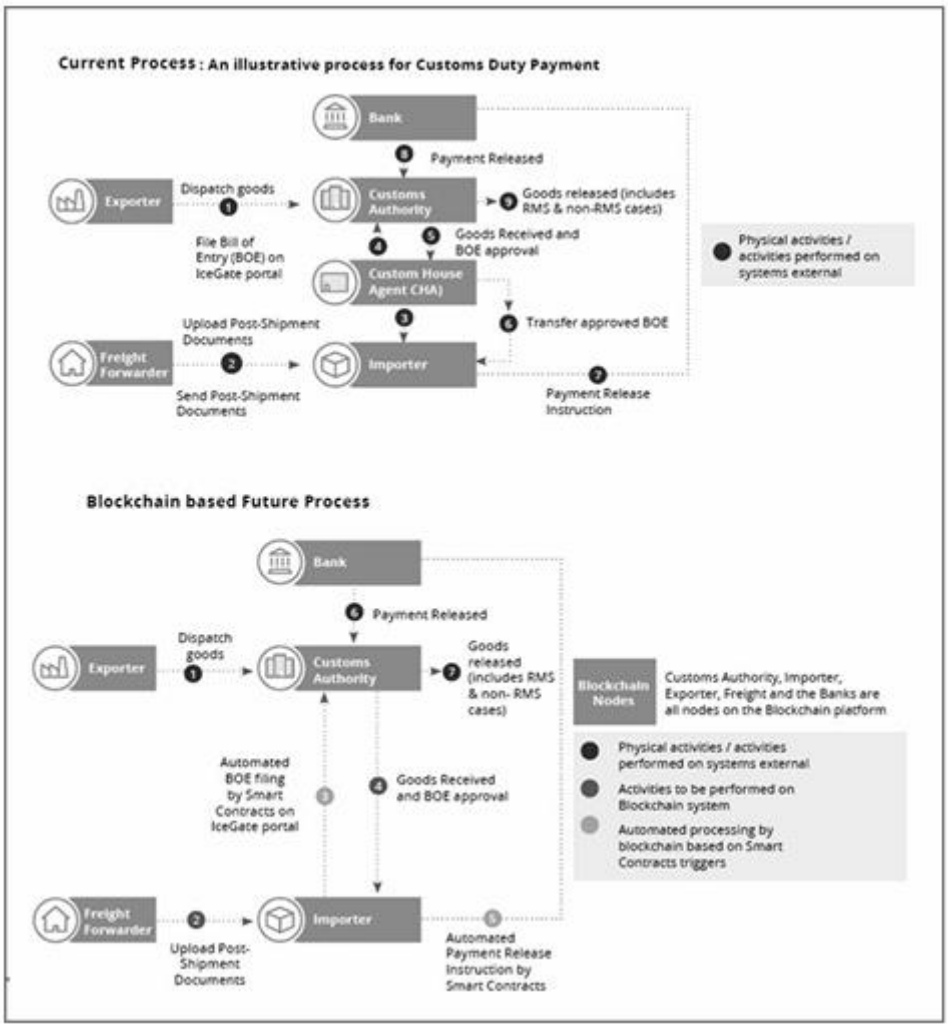

Figure 17 : Blockchain Enabled Customs Duty Payment Process

Conclusion

This case study examines the implementation of blockchain technology in customs services within the EU and Turkey. Blockchain promises to revolutionize customs operations by enhancing transparency, efficiency, and security.

The EU and Turkey share similar challenges and opportunities in applying blockchain technology in customs services. Addressing regulatory, technical, and organizational barriers is essential for realizing the full potential of blockchain in enhancing customs operations and facilitating international trade. Collaboration and knowledge sharing between the two regions can accelerate progress and drive innovation in customs services.

General Conclusion :

In conclusion, this research has shed light on the transformative potential of blockchain technology in enhancing customs services, with a focus on the case study of the European Union and Turkey. Through a comprehensive analysis, it has become evident that blockchain offers a myriad of benefits to customs operations, including increased transparency, efficiency, security, and reduced costs.

By leveraging blockchain, customs authorities in both the European Union and Turkey have been able to streamline processes such as trade documentation, clearance, and enforcement. The immutable and decentralized nature of blockchain ensures the integrity of data, minimizes the risk of fraud, and fosters trust among stakeholders.

Furthermore, blockchain facilitates greater collaboration and information sharing among customs agencies, border authorities, and other relevant parties, thereby facilitating smoother cross-border trade and compliance with regulations. This interoperability is crucial for countries like Turkey seeking to align with the standards and practices of the EU customs union.

Despite the numerous advantages, it is essential to acknowledge that the implementation of blockchain in customs services also poses challenges, such as technological barriers, interoperability issues, and the need for regulatory frameworks. However, with continued research, investment, and collaboration, these challenges can be overcome, unlocking the full potential of blockchain in revolutionizing customs operations.

In conclusion, the case study of the European Union and Turkey exemplifies how blockchain can serve as a catalyst for modernizing customs services, promoting economic growth, and facilitating international trade in an increasingly interconnected world. As both regions continue to embrace digital innovation, the adoption of blockchain technology will undoubtedly play a pivotal role in shaping the future of customs administration.

Recommandation

- **Appropriate Legislation**: Adopting suitable legislation that supports the use of blockchain technology in customs operations, including data protection laws and cybersecurity regulations. These regulations should provide a clear legal framework that enables the safe and effective adoption of technological innovation.

- **Data Protection and Privacy**: Implementing robust mechanisms to protect data and ensure privacy during customs operations that utilize blockchain technology. This can be achieved through the use of encryption techniques and the implementation of strict access policies.

- **Integration with Existing Systems**: Developing blockchain technology solutions that seamlessly integrate with existing customs and international trade systems in the European Union. These solutions should support secure and efficient data exchange between different systems.

- **International Cooperation**: Enhancing international cooperation with EU member states and international partners to exchange knowledge and expertise regarding the use of blockchain technology in customs. This can be achieved through regular information exchange and participation in international research and development projects.

- **Adoption and Training**: Providing appropriate training and education programs for customs officials in the European Union to enhance their understanding of blockchain technology and its applications in customs operations. These programs should focus on building the technical and leadership skills necessary to ensure the successful implementation of the new technology.

Future Reaserch Prospect

- **Blochkchain Technology and Customs Clearence Procedures ;Comparative Study**
- **Application of Blockchain Technology to the International Trade and Customs Regulations**

Testing the Validity of the Hypothesis

Ho1-Blockchain technology can help increase the security of customs operations and procedures.

1-The hypothesis that blockchain technology can enhance the security of customs operations and procedures holds merit. Blockchain's inherent features like transparency, immutability, and traceability can potentially revolutionize the way customs processes are conducted. By providing a tamper-proof and transparent ledger of transactions, blockchain can mitigate risks such as fraud, smuggling, and counterfeiting in customs procedures. However, successful implementation would require overcoming challenges such as scalability, interoperability, and regulatory compliance, necessitating further empirical research and real-world testing to validate its effectiveness in enhancing customs security.

Ho2- blockchain could help to reduce costs associated with customs processes

and procedures

2- The hypothesis that blockchain could reduce costs associated with customs processes and procedures is plausible. By providing a decentralized and transparent platform for recording transactions and verifying the authenticity of goods, blockchain can streamline customs operations, minimize paperwork, and reduce the need for intermediaries, thus potentially lowering costs. However, successful implementation would require addressing challenges such as scalability, interoperability, and regulatory compliance, while also ensuring that the benefits outweigh the initial investment in blockchain infrastructure. Further empirical research and real-world pilot projects are necessary to validate this hypothesis and assess its practical implications on cost reduction in customs procedures.

Ho3- The adoption of blockchain technology in custom services will not enhance or ease customs transactions between the European Union countries and Turkey

3- The hypothesis that the adoption of blockchain technology in custom services will not enhance or ease customs transactions between the European Union countries and Turkey is debatable. While it's true that implementing blockchain comes with challenges such as interoperability issues, regulatory complexities, and the need for infrastructure upgrades, dismissing its potential benefits outright may overlook significant opportunities for improvement. Blockchain's features like transparency, immutability, and decentralized verification have the potential to streamline customs procedures, reduce paperwork, and enhance trust among stakeholders. However, successful implementation would require addressing these challenges effectively and ensuring collaboration between EU countries and Turkey. Further empirical research and pilot projects could provide valuable insights into the viability of blockchain in improving customs transactions between these regions.

Reference

- How the European Union work. (2012). *The European Union explained :* .
- Baliouz, N. L. (2023). Blockchain in agriculture supply chain management case study IMB food. BISKRA: University mohamed kheider.
- Belu, M. (2020). Blockchain Technology and Customs Procedures. *The romanian economic journal* .
- Carmen Holotescu, V. H. (2018). *Understanding Blockchain Technology and how to get involved.*
- Chevers, A. (2013). DEVELOPMENT OF SCIENTIFIC ACTIVITY . *DEFINITIONS OF CUSTOMS FUNCTIONS IN THE CONTEX OF ECONOMIC INTEGRATION AND GLOBALIZATION* . Customs Scientific Journal .
- Ghazzalin, O. (2023/2024). THE ROLE OF DIGITIATION OF THE CUSTOMS SECTOR IN FACILITATING ALGERIAN FOERIGN TRADE OPERATIONS. *Proposing a framework for digitizing Algerian customs based on international experiences* . faculté 8 MAI 1945 Guelma, ALGERIA.
- Gürcan, B. (2021). APPLICATION OF BLOCKCHAIN TECHNOLOGY TO THE INTERNATIONAL TRADE AND CUSTOM REGULATIONS . Austrian Computer Society .
- INGRAM, J. C. (1973). THE CASE FOR EUROPEAN MONETARY INTEGRATION. *ESSAYS IN INTERNATIONAL FINANCE* . Princeton, New Jersey.
- Journal World Customs. (2007, march). World Customs Journal Volume 1.
- marina kESNER-škREB. (2010). The European Union Customs Union. Dans *Financial Theory and Practice* (pp. 99-100). ZOGROB.
- Nareth, O. (2021). European Union. *International Organisations* . Pannasastra University pf cambodia, cambodia.
- Nas Çiğdem. (s.d.). TURKEY-EU CUSTOMS UNION: ITS MODERNIZATION AND POTENTIAL FOR TURKEY-EU relation. IKV and Yıldız Technical University.
- Nikita Vlasov, B. C. (2020). *Blockchain for supply chains and international trade.* brussels: European Parliamentary Research Service.
- Okazaki, Y. (2018, JUIN). Unveiling the Potential of Blockchain for customs. *WCO Research Paper* . world customs organisation.
- PALA, A. M. (2011). *THE CUSTOMS UNION BETWEEN TURKEY AND THE EUROPEAN UNION AND ITS EFFECTS ON THE TURKISH ECONOMY* . Boston, Massachusetts : Northeastern University .

- pardalos, A. I. (2021). *Foundation of blockchain Theory and Application.* Springer.
- Parliament, e. (2020, may). European Parliamentary Research Service. *Blockchain for supply chains and international trade* .
- Parson, C. (2019). *A brief histor of the european union.*
- PEKDEMİR, E. (2021). THE USE OF BLOCKCHAIN TECHNOLOGY IN PUBLIC ADMINISTRATION: IMPLICATIONS FOR TURKEY .
- Sana Sabah Sabry, N. M. (2019, Decembre). The road to the blockchain technology: Concept and types . *Periodicals of Engineering and Natural Sciences* .
- Selçuk Balı, M. A. (2022). BLOCKCHAIN IN FINANCE, MARKETING AND OTHER. ATLAS AKADEMİK BASIM YAYIN DAĞITIM TİC. LTD. ŞTİ.
- Selçuk Balı, M. A. (2022). BLOCKCHAIN IN FINANCE, MARKETING AND OTHERS. NOBEL BİLİMSEL.
- Shrivas, M. K., & Yeboah, D. T. (2019). the Distruptive Blockchain: types, platforms and applications. *Texila International Journal of Academic Research* , 3.
- Świerczyńska, J. *ENTREPRENEURSHIP AND MANAGEMENT.* pologne: SAN Publishing House |.
- Uğur ÖZGÖKER, Z. A. (2020). THE MODERNISATION OF THE EU-TURKEY CUSTOMS UNION. German Institute for International and Security Affairs.

Appendix A

* ملحق بالقرار رقم ....1082.... المؤرخ في ..... 27 ديسمبر 2020

الذي يحدد القواعد المتعلقة بالوقاية من السرقة العلمية ومكافحتها

الجمهورية الجزائرية الديمقراطية الشعبية

وزارة التعليم العالي والبحث العلمي

مؤسسة التعليم العالي والبحث العلمي:

نموذج التصريح الشرفي

الخاص بالالتزام بقواعد النزاهة العلمية لإنجاز بحث

أنا الممضي أسفله،

السيد(ة): دبرة لبنى الصفة: طالب، أستاذ، باحث طالبة

الحامل(ة) لبطاقة التعريف الوطنية رقم [illegible] والصادرة بتاريخ 25/02/2020

المسجل(ة) بكلية / معهد العلوم الاقتصادية والتجارية وعلوم التسيير قسم علوم تجارية

والمكلف(ة) بإنجاز أعمال بحث (مذكرة التخرج، مذكرة ماستر، مذكرة ماجستير، أطروحة دكتوراه)،

عنوانها: The role of Blockchain Technology in improving customs proccdures

- study case of : Europan Union, Turkey -

أصرح بشرفي أني ألتزم بمراعاة المعايير العلمية والمنهجية ومعايير الأخلاقيات المهنية والنزاهة الأكاديمية المطلوبة في إنجاز البحث المذكور أعلاه .

التاريخ: 26/06/2021

توقيع المعني (ة)

Appendix B

الجمهورية الجزائرية الديمقراطية الشعبية

وزارة التعليم العالي والبحث العلمي

جامعة محمد خيضر –بسكرة

كلية العلوم الاقتصادية والتجارية وعلوم التسيير

قسم العلوم التجارية

بسكرة في:2024-05-30

إذن بالطبع

أنا الممضي أسفله الأستاذ:بن عبيد فريد

الرتبة:أستاذ التعليم العالي

قسم الارتباط (إداريا) :العلوم التجارية

أستاذ مشرف على مذكرة ماستر للطلبة (ة): دبزة لينة

الشعبة: العلوم التجارية

التخصص: مالية وتجارة دولية

بعنوان:

The role of blockchain technology in improving customs procedures

Study case of: European Union, Turkey

أرخص بطبع المذكرة المذكورة.

الأستاذ المشرف

رئيس القسم