Bachelor's Degree in

Comparative, European and International Legal Studies

THE ROLE OF BLOCKCHAIN IN THE FIGHT TO CORRUPTION: THE CASE OF UZBEKISTAN

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Blockchain, Bitcoin and Etherium, Land registries, UNDP, Uzbekistan

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1. Introduction

Recent technological revolutions have greatly changed the life we live and how we do business. These revolutions have largely eliminated the barriers caused by physical boundaries, easing information storage and exchange and speeding up communication. Although they came into existence in a short time, we witnessed a gradual development every 5-10 years. First, we saw the emergence of personal computers. This was followed by the Internet revolution. Then, social media was introduced. Afterward, smartphones became an integral part of our lives. Finally, blockchain technology emerged as a breakthrough, with the potential to revolutionize the financial world offering great opportunities for many other sectors.

All this has happened in the last 15 years, and we are faced with a novel phenomenon, developments related to blockchain technology can be summarized as follows[1]:

➥ Bitcoin introduced us to a new payment method called cryptocurrency. Its distributed character, without central authorities and intermediaries, draws the immediate attention of the financiers and antagonists of the current world monetary system. We saw that international remittance was possible in seconds, while it took days with conventional banking. Bitcoin was also a significant source of speculation, with sharp rises and falls in value.

➥ The technology behind Bitcoin is blockchain. This technology is not only limited to cryptocurrencies. It can be used in other areas, like land registries, self-driving cars or drones, charging stations, and landing pads or auctions.

➥ Creation of Ethereum provided smart contracts with more rapid and faster transactions between seller and buyer. Smart contracts are self-executing contracts, which upon meeting certain conditions automatically enforce and execute themselves without a need for intermediaries. Buying a ticket online is the most common example.

➥ Blockchain systems use two kinds of consensus mechanisms. One of them is "proof of work". In this mechanism, miners validate transactions by solving a 64-digit encrypted hexadecimal number called a hash. This needs time and computer power. 'Proof of stake" arose as an alternative to 'proof of work". It significantly reduces energy consumption. In this mechanism, transactions are validated by selected validators. It is necessary to stake a certain amount of coins to be a validator. A certain number of validators validate that the block is correct. Therefore, establishing authentication and proof of the transaction.

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[1] Gupta, V. (2019, August 21). *A brief history of blockchain.* Harvard Business Review. https://hbr.org/2017/02/a-brief-history-of-blockchain

➼ Finally, blockchain scaling came out as a solution to speed up transactions, which were too slow due to the distributed nature of blockchain technology. Scaling engages several computers, instead of all nodes, to validate the transaction, which increases the speed considerably.

Overall, we still need some time to see whether blockchain is a revolutionary technology or just hype. While it offers promising results in many areas, it causes concerns and hesitation. This paper aims to find out whether it can play a role in the prevention of corruption. First, basic information will be given on blockchain systems. Then, it will be discussed whether blockchains can be an effective tool in preventing corruption. Finally, it will be explained concretely, analyzing the applications of blockchain in Uzbekistan, and the role of blockchain in the corruption fight.

1.1 What is the blockchain and how it works

Blockchain is a novel technology difficult to understand. It was pioneered by Bitcoin, which arose as a digital currency when an anonymous person nicknamed Satoshi Nakamoto wrote about blockchain technology back in 2009. It is also difficult to define what blockchain is. The advantages of this technology can be only explained by describing certain characteristics of it[2]:

Blockchain has a distributed network –i.e. a distributed ledger. This means that it is not centralized: there are no central authorities or intermediaries in the blockchain network. It consists of independent members cooperating to transfer value to one another securely and correctly.

Blockchain uses cryptographic mechanisms to reach an agreement between members in the network.

The main purpose of blockchain is to transfer value between its members securely and correctly, without reliance on a central authority.

Blockchain is immutable: once the members approve a transfer, it is impossible to change it later.

Consensus on the blockchain is documented based on cryptographic proof, which needs no trustable third party. This cryptographic proof provides a secure way to reach an agreement, without the need for a third-party entity responsible for validation.

In systems like centralized databases or financial institutions, it is often necessary to have a third party, such, as a bank or central authority to verify and validate transactions.

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[2]Niforos, Marina. (2017). Blockchain in Development-Part II: How it Can Impact Emerging Markets. 10.13140/RG.2.2.34167.32163.

Table 1: Differences between the terms centralized, decentralized, and distributed processes.

Centralized	Decentralized	Distributed
Transactions and records are controlled by a central entity.	*Transactions and records are controlled by intermediaries.*	*Transactions and records are controlled by all members in the network. This is how blockchain technology works.*

Source: International Finance Corporation, 2019

This is a short description of how blockchain technology works[3][3]:

The basic components of blockchain technology are cryptography and mainstream software engineering. Blockchain operates on a distributed ledger technology (DLT). The DLT network can be open or permissioned. When it is open, whoever wishes can join the network. All members can see the encrypted transaction in the network once it is created. Bitcoin exemplifies open DLT networks. On the other hand, in a permissioned network, transactions require prior authorization before they can be executed. Either entities or individuals are authorized to give this permission. These are regarded as trusted members, who control entry in the network and rights or responsibilities of members. The most obvious advantage of such authorization or permission is to speed up transactions. Ripple is an example of a permissioned DLT, where specific transactions require validation from multiple validators.

A particular member has a private key to enter the network. The transaction is created using this key. The creation of the transaction is communicated to all members in the network, Who approve the transaction, and thus a new block is added to existing blocks. Table 2 shows how the network works.

Table 2: A typical operation of a blockchain network (example of cryptocurrency)

Step 1	A person is sending money to another person.
Step 2	This transaction is created in the network as a block.

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[3]Niforos, Marina. (2017). Blockchain in Development-Part II: How it Can Impact Emerging Markets. 10.13140/RG.2.2.34167.32163.

Step 3	The transaction is informed to all members of the network.
Step 4	The money transfer is realized.
Step 5	A block representing the money transfer is added to the existing blocks.
Step 6	The members approve the transaction and the block.

Source: International Finance Corporation, 2019

1.1.1 Types of blockchain systems and current use

Blockchain systems can be categorized in different ways. In general, we can say there are four different types of blockchain systems[4] [5]:

Public blockchains

It is enough to have an internet connection to access this type of blockchain system. You download the system into your computer, which authorizes you to make the same transactions with other nodes. Here, the members of the system can make all transactions offered by the system. Public blockchains are perfectly decentralized and distributed. Transactions can be seen by all members, and they are evidenced using proof-of-work or proof-of-stake mechanisms.

This does introduce an element of anonymity in the sense that the specific individuals involved in these transactions are not always directly identifiable through their real-world identities. Since these transactions occur between nodes rather than natural persons. Instead, transactions are associated with cryptographic addresses or keys, which are pseudonymous.
It's important to distinguish between anonymity and pseudonymity. Anonymity implies complete concealment of identity, while pseudonymity involves the use of a persistent identifier that is not directly linked to real-world personal information. In public blockchains transactions are traceable through these pseudonymous addresses, providing a level of accountability and transparency. While the initial layer of interaction might seem anonymous, it's essential to understand that public blockchains are also open for scrutiny. Analyzing transaction patterns and addresses can sometimes lead to re-identification of participants, thus enhancing the transparency of the network.

[4]Antolin, M. . (2023, May 11). What Are the Four Kinds of Blockchains? Coindesk.
https://www.coindesk.com/learn/what-are-the-four-kinds-of-blockchains/
[5]The Harvard Law School Forum on Corporate Governance. (2022, January 28). Blockchain in the Banking sector:
A Review of the landscape and opportunities.
https://corpgov.law.harvard.edu/2022/01/28/blockchain-in-the-banking-sector-a-review-of-the-landscape-and-opportunities/

Moreover, emerging technologies and regulations are focusing on enhancing the privacy aspects of blockchain networks to strike a balance between transparency and individual privacy. This might add a layer of privacy without compromising the overall transparency of the network.

Although all transactions are transparent,   members can prefer being anonymous when entering the system.This does introduce an element of anonymity in the sense that the specific individuals involved in these transactions are not always directly identifiable through their real-world identities. Since these transactions occur between nodes rather than natural persons. Instead, transactions are associated with cryptographic addresses or keys, which are pseudonymous.
It's important to distinguish between anonymity and pseudonymity. Anonymity implies complete concealment of identity, while pseudonymity involves the use of a persistent identifier that is not directly linked to real-world personal information. In public blockchains transactions are traceable through these pseudonymous addresses, providing a level of accountability and transparency. While the initial layer of interaction might seem anonymous, it's essential to understand that public blockchains are also open for scrutiny. Analyzing transaction patterns and addresses can sometimes lead to re-identification of participants, thus enhancing the transparency of the network. Moreover, emerging technologies and regulations are focusing on enhancing the privacy aspects of blockchain networks to strike a balance between transparency and individual privacy. This might add a layer of privacy without compromising the overall transparency of the network.

 Once transactions are completed, they cannot be changed, so they are immutable. Through the activity of mining, members are rewarded as they discover new transactions and blocks. These rewards often come in the form of cryptocurrency tokens, such as Bitcoin, which are granted to miners as an incentive for contributing to the security and functionality of the blockchain network. Or they are entitled to a fee for the transaction they verify. Despite these advantages, one major downside of public blockchains is that they are not appropriate for sensitive data due to the transparency of transactions. As a result, financial secrets or personal health data could be easily disclosed to unwanted persons. Another major setback of the system is that transactions take time to be carried out, as they are distributed to every member. At times, the system can be even clogged. Today, the speed of transactions matters, so this problem stands out as a serious matter that has to be solved for public blockchain systems.

With all these said, blockchain systems, for example, Bitcoin, developed new technologies to increase the speed. Presently, Bitcoin's Lightning Network technology can perform one million transactions per second, whereas it was limited to only several transactions at the outset when Bitcoin entered the market. Thanks to this technology, Bitcoin's users transfer funds in seconds, with virtually no cost. The success of Bitcoin in increasing the speed clearly shows that public blockchain systems can remain perfectly distributed and develop technologies aimed at increasing the speed, and that scaling as a solution for the speed problem may not be necessary.

Private Blockchains

In private blockchain systems, in contrast with public blockchain systems, only several people are allowed to access the system. Such blockchain systems are controlled by a particular entity, which decides who can participate in the system. In that way, several problems of a public blockchain, which were discussed above, can be solved. Sensitive data and transactions can be better protected, transactions can be carried out more securely, and the system is speedier. However, the system is no more distributed, which is the core characteristic of blockchains. There is a central power and several middlemen.

Financial institutions and governments establish private blockchains, in that way, the transfer of particular assets can be made easily and speedily. Assets can be transferred without the legal barriers of different jurisdictions. Different entities in different locations in the world can enter into contracts simply and stably and securely transfer assets from one to another. And these transactions can be carried out instantl. Liink as a successfully developed example of private blockchain established by major financial institution J.P. Morgan, became known due to its enhanced efficiency and transparency for the banking industry's cross-border payment processes and information sharing. Liink provides tools for compliance and sanctions screening, helping banks identify and prevent transactions involving sanctioned entities or potential financial crimes. The streamlined processes and reduced need for manual intervention results in cost savings for participating financial institutions. Additionally, Liink fosters collaboration among banks, making it easier for them to work together on compliance and payment-related issues.Since it is a private blockchain system, participation and access are controlled and restricted to authorized entities within the financial industry.[6]

Another example is Amazon Managed Blockchain is a service provided by Amazon that allows businesses and organizations to create and manage their own blockchain networks. Amazon provides setting up and maintaining the blockchain infrastructure. Organizations can use Amazon Managed Blockchain to create private blockchain networks for various purposes, such as supply chain tracking, financial transactions, and more. This service gives organizations the benefits of blockchain technology without the need to handle the intricacies of maintenance of infrastructure. In both cases, these are examples of private blockchain systems. Private blockchains are networks where access and participation are controlled, typically by a specific group of organizations or participants. This contrasts with public blockchains like Bitcoin and Ethereum, where participation is open to anyone[7].

In recent years, the European Union has implemented blockchain and other decentralized technologies to foster the rapid exchange of electronic data in cross-border civil and criminal proceedings. For example,. e-CODEX (e-Justice

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[6] David L. Portilla The Harvard Law School Forum on Corporate Governance. (2022b, January 28). *Blockchain in the Banking sector: A Review of the landscape and opportunities.* https://corpgov.law.harvard.edu/2022/01/28/blockchain-in-the-banking-sector-a-review-of-the-landscape-and-opportunities/
[7] Ibidem

Communication via Online Data Exchange) is a crucial technological enabler for modernizing cross-border communication in the context of judicial proceedings. It facilitates interoperability between the IT systems used by judicial authorities, allowing various national e-justice systems to exchange data and perform cross-border procedures in civil and criminal matters. Its users, including competent judicial authorities, legal practitioners, and citizens, can electronically exchange documents, legal forms, evidence, and other information swiftly and securely[8].

On the other hand, entities running private blockchains may, locally or globally, encounter several legal problems, mainly concerning financial crimes like money laundering or terrorist financing and many more. To be more precise, organized crime groups or terrorist groups deem blockchain systems as a suitable way of transferring money, in which they will encounter no legal barriers imposed by sovereign states. As a result, states wish to follow and monitor suspicious transfers and impose certain requirements on entities not only of public blockchains but also running private blockchains, which will enable the effective monitoring and control of such transfers. Governments are interested in controlling private blockchains because access to these networks is limited and restricted to specific individuals or entities who can add participants to view transactions. This limited access makes private blockchains a potential concern for governments in terms of monitoring and oversight to prevent illicit activities.The goal is to strike a balance between innovation and security, ensuring that the technology is used for legitimate and positive purposes while minimizing potential risks.In conclusion, several international regulatory frameworks and standards, such as KYC or AML policies, are introduced to prevent financial crimes, and entities running blockchains are expected to comply with these rules and standards. The protection of private data is another important issue. Know Your Customer (KYC) and Anti-Money Laundering (AML), both are regulatory frameworks established to prevent financial crimes, ensure the legitimacy of financial transactions, and maintain the integrity of the financial system. KYC ensures that businesses and financial institutions verify the identity of their clients, which involves collecting and verifying personal information to ensure that individuals or entities are not involved in illicit activities such as money laundering or fraud. AML policies involve measures, regulations, and procedures put in place by financial institutions and regulatory authorities to detect and prevent money laundering and the illegal movement of funds.

States expect entities running blockchains to ensure the private data security of their citizens. The rights of the consumer should be also protected when they make transactions using blockchain systems. Finally, entities running private blockchains should comply with national legal frameworks imposing taxation, accounting, and reporting obligations on entities.

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[8] Ferranti, I., & Ferranti, I. (2022). Sistema e-Codex, come funziona e perché è una svolta per la Giustizia UE. *Agenda Digitale*.
https://www.agendadigitale.eu/documenti/giustizia-digitale/sistema-e-codex-come-funziona-e-perche-e-una-svolta-per-la-giustizia-ue/

Hybrid Blockchains

These blockchain systems combine the characteristics of public blockchains and private blockchains. They are run by one entity, and members can choose between the blockchain type, public or private, on which they will make the transaction. As a result, they are allowed to protect their sensitive data via their transactions on a private blockchain, yet, they can still benefit from the distributed feature of a public blockchain. The best example of hybrid blockchains is Xinfin. XinFin combines Ethereum's public blockchain with Quorum's private blockchain, resulting in a dual-layered structure. This combination leverages the strengths of both types of blockchains, creating a versatile platform suitable for various applications. Quorum's private blockchain allows XinFin to meet compliance requirements for transactions that involve sensitive data or legal regulations, while Ethereum's public blockchain provides transparency where needed.

The main advantage of hybrid blockchains is the protection of keeping sensitive data,that individuals or entities wish to protect from unauthorized access or exposure. This combination enables secure transactions while addressing concerns related to privacy and data protection in a decentralized environment As a disadvantage, users are not rewarded, and it takes time to develop new versions of the blockchain system.

Consortium Blockchains

Private blockchains can be made more decentralized by giving control to multiple entities. Such blockchain systems are called consortium blockchains. Only members of the consortium have access to the system. They are usually designed for transferring assets among institutions who are in close relation and cooperation. The best example of consortium blockchains is R3, which is a blockchain system for Fortune 500 companies, where they can carry out several transactions. Ripple Labs Inc. Round 3 (R3) developed by "Corda" represents a platform that specifically was created for financial activities among companies. The advantage of this blockchain is featured by: no central database that requires connection from all users. Instead, every user maintains an updated ledger copy containing the most recent transactions. When the transaction is being performed, the information is only shared among the parties involved, upon agreement and verification of which, the transaction is added to each user's ledger.

It has several advantages over other types of blockchains: It decreases the volume of data to be stored and processed. Tampering or deletion of the data is significantly challenging for malicious individuals. It permits detailed control over data access, determining which individuals can reach specific information. Additionally, R3 employs consensus mechanisms to validate transactions without energy-intensive mining.

The following types of blockchain systems are implemented by the companies depending on their level of centralization[9] and the aim pursued:

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[9] "The 5 Kinds of Blockchain Projects (and Which to Watch out For)." *Harvard Business Review*, 20 Dec. 2019, hbr.org/2019/10/the-5-kinds-of-blockchain-projects-and-which-to-watch-out-for

Fear of Missing Out Solutions (FOMO)

They are the most centralized type of blockchains. They are usually set up as an internal system of a company. In fact, they are not true blockchains; only the company wishes to give the impression that they are implementing blockchain technology. FOMO solutions tend to be highly centralized often led by a company and used with a limited number of partners. These solutions are usually implemented in an attempt to showcase innovation without considering how blockchain technology can truly benefit the business or if it is a suitable choice. Consequently, FOMO projects may involve integrating blockchain into existing tech initiatives where it may not be well suited. While FOMO blockchain solutions may not generate value they can still serve a purpose. They can send a message to the market that your organization is up to date with trends catching the attention of potential customers who might give your organization a second look. Competitors may also invest time and resources in projects due, to their fear of missing out (FOMO).Therefore, there is no intention of using blockchain. In short, these systems are primarily used for marketing to give an innovative image.

Invitation-Based Blockchain Solutions

These blockchains are set up by a giant company, which dictates smaller companies that are dependent on it to be a member of the system. Smaller companies have to share some of their data with the giant company and become subject to it. However, this system, sometimes, may also offer benefits. For example, in the food industry, the source of contamination can be easily traced in the network, which would take significantly more time without a blockchain system. Because it would be necessary to check one by one every stage, in which the food is processed, in the network, which is time-consuming. Stages can be easily checked in the blockchain system, and the source of contamination can be traced in a short time.

Opportunistic Solutions

Opportunistic solutions intend to address the difficulties or opportunities associated with record-keeping, in which existing solutions have served poorly. For example, the blockchain solution developed by the Australian Stock Exchange speeded up financial trading, ensuring an easier way of record-keeping transactions compared to the existing solutions. The implementation of blockchain technology by the Australian Stock Exchange (ASX) has simplified and streamlined the process of financial trading and record-keeping in comparison to traditional systems. In the old system, financial transactions involved multiple intermediaries, paperwork, and manual reconciliation processes. This often led to delays, errors, and inefficiencies in trading operations. Record-keeping requires extensive documentation and manual verification, which could result in discrepancies and data inconsistencies. ASX introduced a decentralized and transparent digital ledger that records every transaction as a "block" linked together in a chronological chain. This ledger is shared and updated in real-time across all

participants, eliminating the need for intermediaries and reducing the risk of errors. Each transaction is securely stored in a tamper-proof manner, ensuring the integrity of the data.

The long-term benefits of blockchain are ignored, opportunistic solutions can add value to the entities, but these solutions have only temporary effects. Nevertheless, the entity, at least, experiences how blockchain systems can be useful for them when intended for long-term use.

Evolutionary Solutions

The blockchain system is intended for a more decentralized market in the long run against possible frauds. The best example of it is the SecuTix application. developed by FIFA. Through this application, fans can buy tickets, transfer them to anyone they wish, or bid for an open sale at a fixed price. The application has the potential for eradicating middlemen and brokers, against the inequalities and frauds in the market, making the ticket market truly decentralized.

Blockchain Native Solutions

They aim to create a decentralized marketplace over time, bringing together the supply and demand in a particular market with no middlemen, using the possibilities of blockchain technology.

1.1.2 Limitations and Prohibitions to the Use of Blockchain

Companies increasingly continue to make investments in blockchain technology because of its attractive features. Nonetheless, they have to be cautious and aware of its limitations. What attracts companies to blockchain technology and what are the limitations?[10]:

➠ Because of the decentralization of blockchain technology, the likelihood of fraud while making transactions is minimum.

➠ Once the transaction is carried out, it is immutable.

➠ It ensures cybersecurity, thanks to its features of encryption and immediate recording.

➠ Because there are fewer middlemen, operating costs can be significantly reduced.

➠ When blockchain technology is set up for operating a network, the source of a problem in the network can be easily traced.

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[10] Knysh, N. (2021, November 22). Introducing Blockchain: Six Limitations For Enterprises To Remember. Forbes. https://www.forbes.com/sites/forbestechcouncil/2021/11/22/introducing-blockchain-six-limitations-for-enterprises-to-remember/?sh=2d687732313f

Along with these benefits, companies should be aware of the following limitations of blockchain technology:

➤ Especially in the case of public blockchains, the network is congested and can even be clogged at times, due to the fact that every transaction made or block built is distributed to every user. To prevent this, companies may opt for private blockchains. However, in this case, data distribution will be limited, and the system will become centralized.

➤ Public blockchains may be free, but they involve some costs for companies specializing in, maintaining and upgrading the system. Blockchain technology may be attractive to companies at the beginning, but they may find it costly later if they do not have enough budget for it.

➤ It may be hard for companies to recruit and employ skilled staff to deal with matters concerning blockchain technology.

➤ Private keys used for accessing the system may be stolen, which means all information in the system is stolen.A private key is a fundamental cryptographic component used to access and control assets within the system. If a malicious actor gains unauthorized access to a user's private key, they can potentially compromise the entire system and access sensitive information, since private keys are paired with public keys in cryptographic systems. The public key is shared openly, serving as an address through which others can encrypt messages or verify signatures. While the private key, kept secret by the owner, is used for decryption and signing transactions. If a private key is stolen, an attacker can impersonate the owner, decrypt sensitive data, sign fraudulent transactions, and gain unauthorized access to accounts and resources. Public keys are meant to be shared openly and can't be used to deduce the corresponding private key, ensuring security. Secure access to private keys is crucial to prevent unauthorized access and maintain the integrity of the system. Without proper safeguards, corruption could be "coded into" the system, undermining the very goals the blockchain seeks to achieve, such as transparency and trust.

➤ There might be hardships with integrating blockchain technology with old technologies already in use by the company. It will incur additional costs to renew these technologies in order to make them compatible with blockchain.

➤ Using proof-of-work so as to validate transactions brings about high energy costs.

Apart from the limitations stated above, networks using a blockchain system, especially cryptocurrencies, are expected to comply with certain environmental, social, and governance (ESG) performance requirements. Institutions investing in or using cryptocurrencies should submit reports related to ESG credentials, and they are strictly audited in this regard. Any non-fulfillment of ESG credentials may significantly and negatively affect a company's expected return on the investments that they make in

cryptocurrencies[11]. For that reason, companies should consider any negative impact caused by ESG requirements before they invest in cryptocurrencies, namely blockchain technology. ESG-related risks can be summarized as follows:[12]

Environmental concerns

The biggest concern is energy consumption and related emissions when the proof-of-work consensus model is used to verify transactions. These would clearly have a negative impact on environmental pollution and global warming. Companies investing in blockchain are required to compensate for these negative impacts. As a solution, companies may prefer private blockchains, which consume far less energy. Apart from this, they can invest in technologies that reduce carbon emissions and environmental pollution.

Social Concerns

Social concerns are mostly related to financial crimes such as money laundering or terrorist financing. Companies investing in blockchain are required to comply with several legal rules like AML or KYC rules (that were mentioned above)to prevent such crimes, which can incur an additional cost for them. In addition to this, blockchains can be a source of concern with regard to the identity of fund owners. Because it is possible to anonymously access the network. This may lead to legal restrictions in different jurisdictions, which can slow down the transactions in the blockchain network.

Governance concerns

It is related to concerns about whether the company investing in blockchain can govern business processes regarding the sustainability of the business, taxation, transparency, or corruption. Several regulatory rules are imposed on companies with a view to ensuring they comply with governance requirements.

1.1.3 Problems and weakness of blockchain

Many authors praise blockchain and focus on its advantages, rather than the problems and weaknesses in connection with it. There may be problems caused by it, and it may underperform due to some weaknesses inherent in it.

Several writers discuss the difficulties associated with adopting blockchain technology in the context of worldwide progress. These difficulties can be outlined as follows [13]:

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[11] Nicola Higgs, Stuart Davis, Paul Davies and Charlotte Collins Part 2: Impacts on the Wider landscape Section 14 Blockchain and ESG July 2020
https://www.lw.com/admin/upload/SiteAttachments/Blockchain%20Legal%20%20Regulatory%20Guidance%20-%20Section%20Edition%2014%20-%20Latham%20authored.pdf

[12] *Ibidem*

[13] Bezovski, Z. Riste T., Tamara J. (2021). The impact and the potential disruption of the blockchain technology on marketing. *Journal of Economics*, *6*(1), 13–22. https://doi.org/10.46763/joe216.10013b

➡ Dependence on the Internet in order to access and utilize blockchain technology. In certain regions of the world, complete Internet infrastructure is not yet in place. Less developed nations lack adequate internet access, preventing them from accessing the advantages provided by Bitcoin technology, which has the potential to significantly enhance their economic growth.

➡ The most striking weakness of blockchain technology is its high energy consumption. Distributing data to all nodes, validating transactions, creating new blocks, discovering blocks, and communicating, all need energy. Computers should run for long hours to execute these processes. It is argued that Bitcoin technology depletes energy sources, increases carbon emissions, and causes global warming.

➡ 'Forking'. Forking in blockchain refers to a situation where a single blockchain splits into two separate paths, creating two distinct chains with their own transaction histories due to differences among participants, usually miners. This happens when there is disagreement about the blockchain's direction. It can lead to disagreement on the course of the block and may result in the creation of two different blocks. Forks can confuse users and investors, as they might hold assets in both the original and the newly forked blockchain. Determining the value and authenticity of these assets can be complex, particularly if there's a lack of consensus on which chain to consider the "true" blockchain.

➡ Another problem is that nodes responsible for discovering new blocks may not perform as wished. Blockchain nodes are individual computers or devices that participate in a blockchain network. Each node stores a copy of the entire blockchain's transaction history and ledger, ensuring transparency and security. Although these nodes are rewarded for their discovery, they validate the transactions slowly because of the insufficient capacity of their computers. The underperformance of nodes can have a cascading effect on the blockchain ecosystem. Slow transaction validation and block discovery increase the overall time it takes to process transactions

➡ Blockchain systems may suffer from problems such as "attack of 51%, double-spending, Sybil's attack or DDos's attack". In these cases, assets may be transferred repeatedly and unjustly. Such transfers give rise to unauthorized asset transfers between the members, thereby impairing the credibility of the blockchain system.When this is the case, it may give rise to the irrevocable loss of value and assets by a considerable amount. Blockchain systems can face several types of cyber attacks, including the following:

1. 51% Attack:This occurs when a single entity or a group controls over 50% of a blockchain's computational power. This allows them to manipulate transactions, reverse payments, or double-spend cryptocurrency. The attackers would be able to prevent new transactions from gaining confirmations, allowing them to halt payments between some or all users. They would also be able to reverse transactions that were completed while they were in control.

2. Double-Spending: In this attack, a user spends the same cryptocurrency more than once. It exploits the time lag between confirming a transaction and updating the blockchain, enabling malicious users to create multiple copies of the same transaction.

3. Sybil Attack: Here, an attacker creates numerous fake identities or nodes on a network to gain disproportionate influence. This can compromise network integrity by manipulating consensus mechanisms.

4. DDoS Attack (Distributed Denial-of-Service): This attack floods a network or system with a high volume of traffic, overwhelming its capacity and causing it to crash. It disrupts normal operations, rendering the system inaccessible to users.

These attacks can undermine the security, integrity, and functionality of blockchain systems, highlighting the need for robust security measures and continuous vigilance.

In the history of inventions, some inventions became merely hype, others caused a disruptive change. Some authors question whether blockchain is merely a hype or a disruptive innovation[14]. The term disruptive innovation was coined by Austrian economist Joseph Schumpeter. It refers to innovations or business practices that act as an inflection point, revolutionize their industry, and eradicate or prevail all existing innovations and practices in the industry. These revolutions have the effect of creative destruction[15].

The evolution of blockchain technology shows that it has great potential for causing creative destruction. However, some scholars challenge this by arguing that blockchain is merely a hype. One of the antagonists of blockchain is economics professor Nouriel Roubini from New York University. According to him, blockchain is "nothing more than a glorified spreadsheet," and is only "the mother of all bubbles."[16]

In order for blockchain to be a disruptive innovation, it has to fulfill conditions of one or several of the following criteria[17];

➤ The innovation should offer simplification compared to incumbent products.

➤ It should significantly reduce costs,

➤ The innovation should have a novel ownership structure that may be influential on organizational performance, employee motivation, or costs.

➤ The innovation should meet unmet needs in the market.

➤ It should offer lucrative profit margins.

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[14] Mitselmakher, Ksenia. 2019. Demystifying Blockchain: A New Wave of "Creative Destruction" or Hype?. Master's thesis, Harvard Extension School.http://nrs.harvard.edu/urn-3:HUL.InstRepos:42004246
[15] Ibidem
[16]Ibidem
[17] Ibidem

➼ It should appeal to a niche audience.

➼ It should influence policy change

➼ It should contribute to long-term economic growth.

It is beyond the scope of the present paper to discuss whether blockchain meets one or several of these criteria. It will be understood better whether blockchain is a disruptive innovation or a hype in the long run. In the long term, we will gain a clearer understanding of whether blockchain is a truly revolutionary innovation or merely a passing trend.

2.1 The Advantages of Bitcoin and Ethereum

A Comparison

Both Bitcoin and Ethereum are cryptocurrencies that use blockchain technology. Bitcoin came out as the pioneer of cryptocurrencies, and presently, is the most popular digital currency. And, Ethereum is the second most popular digital currency. Both work on the principles of distributed ledgers and encryption, but they are not exactly the same. While Bitcoin limits itself to only being a medium of exchange or payment network, Ethereum enjoys several features other than just being a digital currency. They are also different in a number of other ways[18] [19]:

➼ Bitcoin is the digital alternative to fiat currencies. It stores and transfers value. Ethereum is more a platform that harbors smart contracts or applications, which are free from fraud, downtime, interference, or control by a third party. Anyone can load its pieces of code as smart contracts or applications and expect that they will interact with the smart contracts or applications loaded by others. In this case, not individuals themselves but smart contracts or applications loaded by them make transactions with each other.

➼Ethereum, recognized for its versatility, incorporates executable codes into its framework. This means that transactions within the Ethereum network are not limited to simple transfers of value; they can also include programmable instructions, known as smart contracts and NFTs. These contracts enable a wide range of dynamic actions to be executed autonomously on the blockchain, extending beyond basic transaction recording.

On the other hand, Bitcoin, the pioneer of blockchain technology, employs a different approach. Its codebase primarily consists of fixed and more straightforward codes, with a primary focus on facilitating the recording of transactions. Unlike Ethereum's flexible smart contracts, Bitcoin's scripting language is intentionally limited to ensure security

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[18] Apostolicas, P. (2021). Explaining Ethereum: Interview with Vitalik Buterin (Part 1). *Harvard International Review*. https://hir.harvard.edu/vitalik-buterin-ethereum-1/

[19] Reiff, N. (2023). Bitcoin vs. Ethereum: What's the Difference? *Investopedia*. https://www.investopedia.com/articles/investing/031416/bitcoin-vs-ethereum-driven-different-purposes.asp

and minimize potential vulnerabilities. This limitation, while restricting its capabilities compared to Ethereum, contributes to Bitcoin's robustness and stability as a decentralized digital currency.

➥ Ethereum can confirm transactions faster than Bitcoin does. Ethereum can make 30 transactions per second, Bitcoin makes 7 transactions per second.

➥ Both of them are public blockchains and suffer from the scaling problem, but they are working on a different solution to solve this problem.

Both of these cryptocurrencies offer similar advantages including;

➥ Direct value transfer without intermediaries

➥ Security against the intervention of third parties.

➥Speedy settlements

➥ Immutability

➥ Cost-saving transfers

On the other hand, their disadvantages include:

➥ Scaling problem, therefore slow-down in verifying transactions

➥ High energy costs

➥ Cyberattacks

➥ Illegal activities carried out on these platforms

➥ Speculations made on their prices

➥ Volatility

When these cryptocurrencies are compared in terms of their advantages and disadvantages over each other, Bitcoin is better in peer-to-peer transactions and value transfers, while Ethereum nicely serves for building smart contracts and applications.

2.2 . How blockchain can eradicate corruption, money laundering, and tax evasion

Digitalization facilitates keeping track of transactions. When paperwork was dominant in making transactions, it will take days to check transactions, which paves the way for corruption, financial crimes, and tax evasion. Digitalization is also important for financial institutions. The more digitalized they become, the easier it will be to follow their

transactions, and thus corruption, financial crime and tax evasion conducted by means of them can be prevented.

It is undeniable that systems based on blockchain technology have a great potential for fighting against bribery, financial crimes like money laundering, and tax evasion by the virtue that they can exactly trace where these actions are committed and by way of permitting carrying out transactions without intermediaries. Typically, this example can be given to demonstrate how a transaction can be done using blockchain technology[20]. The World Bank wishes to provide funds for the education infrastructure of a country. If it is physically done on paperwork, there will be certain stages until the money arrives at the final users. And at each stage, there is a possibility of corruption, and it takes a long time to determine who did it. If the same transaction is made through blockchain technology, the stages where the money transfer will be made, who will be responsible for it, and any other requirements are digitally determined by a smart contract using blockchain. In the event of leakage or corruption, the stage where it happens and who is responsible for it can be easily traced. It can be easily understood whether the money has been transferred to the intended beneficiaries.

These features of blockchains make them conducive to preventing corruption, money laundering, and tax evasion[21]:

➽ Transactions are cryptographically secured, so it is out of the question to deny whether or not the transaction has been done. It means that once a transaction is confirmed and recorded on the blockchain, the sender cannot deny having initiated the transaction. Similarly, the recipient cannot deny having received the transaction, it becomes immutable and cannot be changed retroactively. Hence, the evidential power of it cannot be denied.

➽ Users of money at each stage can be easily identified.

➽ As there will be no intermediaries, transaction time and costs will be lessened.

➽ Any transaction verified in the system will be distributed to all the nodes in the system which makes the accuracy of the transaction unquestionable.

➽ Requirements on the transaction will be detailed through smart contracts, so it will be almost impossible for people intending to get involved in illegal activities.

➽ Transactions are watched over not only by the authorities responsible for preventing illegal activities but also by every member of the system. This ensures transparency and effective control of illegal activities.

Financial institutions and transactions are vulnerable to the ill intentions of illegal activists. That is why a number of legal requirements related to reporting and

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[20] Carroll, E. a. E. A., & Carroll, E. a. E. A. (2019, June 6). Can cryptocurrencies and blockchain help fight corruption? *World Bank Blogs*. https://blogs.worldbank.org/voices/can-cryptocurrencies-and-blockchain-help-fight-corruption
[21] Ibidem

recordkeeping are imposed on financial institutions. These requirements simply oblige financial institutions to know and be able to trace every transaction made by their customers, which is a challenging task if done in conventional ways. That is, in the event that any breach of laws on money laundering, terrorist financing, taxation, corruption, etc., the financial institution will be liable unless it can trace the source of the crime in its books and report the real culprits to authorities[22]. At this point, blockchain technology comes into play, although many other digital technologies may be used.

To give an example, American laws require financial institutions to establish at least four mechanisms to fight against financial crimes[23]:

- Formulating internal policies, controls, and procedures aiming at easily tracing the illegal activities of their customers

- A responsible person that will supervise these

- Constantly training their staff in this regard

- An independent audit function

Financial institutions also take other measures in order to fulfill their responsibility in reporting and monitoring suspicious fund transfers. One such initiative is the information-sharing system among banks. High compliance costs push financial institutions to look for cost-saving alternatives like blockchain.

It is proposed that financial institutions can save greatly in terms of their compliance costs if they use blockchain technology. Here, the major obstacle is that banks do not want to share the private information of their customers in a system that is open to all. At this point, a hybrid blockchain can be the solution. For this purpose, a private blockchain network can be established among banks, governmental agencies, and law firms[24].

In this system, all compliance requirements are entered into the blockchain system. When a customer opens a bank account at any bank, this account is checked according to compliance requirements, and the relevant information is shared with all other banks. As a result, thanks to the possibilities provided by blockchain technology, compliance requirements can be fulfilled with little cost. Whenever new information related to this customer is entered by any bank, it is recorded on the blockchain ledger and all members can access the updated information. Moreover, every record can be easily identified by the blockchain system, and the customer information can be checked instantly. In the current system, such information sharing takes 30-50 days[25].

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[22] Chung-Chia Huang and Asher Trangle, January 26, 2020. Case studies: Anti-Money Laundering and Blockchain Technology https://projects.iq.harvard.edu/files/financialregulation/files/aml_case_study_0.pdf
[23]Ibidem
[24] Ibidem
[25]Ibidem

In the current system, each bank employs staff and allocates sources to fulfill compliance requirements. This means that there is the same function doing the same job in every bank. If a blockchain system is set up, the system will do all the jobs instead of these functions. Even, an external function, which would be responsible for operating the blockchain outside the organization would be enough. The idea is that instead of each bank having its own internal staff and resources dedicated to compliance tasks, the blockchain system, along with this external function, would handle these tasks collectively for all the banks involved. This external function could be responsible for maintaining and managing the blockchain network, ensuring its security and reliability, and overseeing the compliance-related processes that the blockchain facilitates. Essentially, it's a way to streamline and centralize certain tasks that would otherwise be duplicated across multiple banks.

Apart from this, the alert mechanism can be formed within the blockchain for customers engaging in illegal activities. This mechanism automatically alerts against the fraudulent and suspicious actions of customers, ensuring the compliance of banks with legal requirements. In addition, governmental organizations responsible for preventing financial crimes may be also alerted by this mechanism[26] .

It is also pointed out that a blockchain system allowing anonymous entry into the system may give rise to the illegal transfer of values and be a source of financial crimes[27]. In this regard, an international legal framework may be needed, which will require blockchain companies to identify suspicious transfers and report them to the relevant authorities. Despite this minor setback of blockchains, the blockchain system can be perfectly used to prevent corruption, financial crimes, and tax evasion. In conclusion, governments or international organizations can securely transfer funds to the final users of funds without intermediaries, who may corrupt the funds. They can easily trace the source of corruption if funds are fraudulently transferred. Suspicious fund transfers, which constitute a financial crime, may be also easily traced by a blockchain system to be established between financial institutions. A similar system can be established among commercial corporations for the purpose of identifying tax evasions. Blockchain systems can be used for any field involving value transfer. Values can be transferred directly in a secure, frictionless, irrevocable, and provable way with no intermediaries, fraudulent behaviors, and corruption. The distributed feature of blockchains makes it virtually flawless. Even though some members try to corrupt the system, this corruption can be easily prevented by the majority of the members unless the corruption is conducted by 51 % of the members, which is nearly impossible.

The errors might occur in this system due to the input of incorrect information or establishing inappropriate criteria by human intervention into the blockchain. When such incorrect data is added to a blockchain, rectifying it can be challenging due to the technology's immutability. Preventive measures include strict validation at data entry points and using smart contracts to enforce accuracy. In some cases, erroneous entries

[26] Chung-Chia Huang and Asher Trangle, January 26, 2020. Case studies: Anti-Money Laundering and Blockchain Technology https://projects.iq.harvard.edu/files/financialregulation/files/aml_case_study_0.pdf
[27] Ibidem

can be countered by adding new transactions to reverse their effects. Major errors might require network upgrades or forks. Blockchain governance can enable decisions on data corrections.

However, such errors are far from impairing the general operation of the system.

2.3.1. Examples of the use of blockchain in different national systems

This section will examine the implementation of blockchain technology in different countries[28]:

El Salvador

It is the first country to accept a cryptocurrency as a national legal tender. Bitcoin has become the legal tender along with US dollars in the country. The El Salvador government believes that banks will be more used due to popularity of cryptocurrency. Because 70 % of the population in the country does not have a bank account. This means that transactions are largely carried out in cash, especially in US dollars.

To provide a legal basis for bitcoin , the Salvadoran government adopted "The Bitcoin Law". This law is made of 16 articles. Article 1 formally recognizes Bitcoin as a legal tender[29]. However, the law passed so quickly in the Legislative Assembly that no discussions were made on possible shortcomings of such practice. One possible issue that should have been considered is sharp fluctuations of bitcoin. For example, Article 4-6 permit collecting taxes in bitcoin. In case of a sharp drop in the price of Bitcoin, public treasury revenues collected in Bitcoin will sharply drop. Article 7 obliges every economic agent to accept Bitcoin for payment when it is offered in return for their goods or services. At that time, employees will have to accept their salaries in bitcoin, which can create an unfavourable situation for them in a country where a cash-based economy is dominant. In addition to these, safeguards regarding the privacy of individuals, when they make transactions in Bitcoin, are not ensured by the law. It should have been considered that many people might be reluctant to make transactions using a cryptocurrency system, which exposes their identity, because of privacy concerns[30].

The Salvadoran government took several steps to incentivize the use of Bitcoin. First, the automatic and free conversion of Bitcoin to US dollar was made possible. Second, the Chivo App, which allows for free exchange of Bitcoin for US dollar and can be downloaded freely by anyone having a smartphone with internet connection, was launched. Normally, in El Salvador, a fee is charged when money is withdrawn from ordinary ATMs, but it is free of charge when money is withdrawn from Chivo ATMs. Third, users of the Chivo app were awarded with a 30-dollar Bitcoin, which is a

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[28] Lacapra, E. (2023, March 9). 5 countries leading blockchain adoption. *Cointelegraph*. https://cointelegraph.com/news/5-countries-leading-the-blockchain-adoption
[29] Marroquín T. (2022, September 01). Bitcoin and Public Finance in El Salvador. Friedrich-Ebert-Stiftung (FES) El Salvador https://library.fes.de/pdf-files/bueros/fesamcentral/19699.pdf
[30]*Ibidem*

significant amount of money in El Salvador, where a per capita GDP in 2022 is merely $413. Finally, people can have a discount when they buy gas using the Chivo App[31].

Despite these incentives, the main objective aimed at by the use of Bitcoin as a legal tender, which is financial inclusivity, cannot be achieved. Although about 60 % of Salvadoran people downloaded the Chivo app, only % 20 of them continued to use it after spending the 30-dollar award. Only 5 % of people paid their taxes with Bitcoin. Only 20 % of enterprises accepted Bitcoin as a means of payment[32]. What is more, the government has spent a significant amount of money on this project. Presently, a great amount of electrical power is being consumed on Bitcoin mining in the country, which restricts the access to electricity by some people. The financial situation of the country also continues to be worsening[33].

The adoption of Bitcoin as the national currency in El Salvador was evidently flawed due to an irrational implementation, marked by a not fully integrated legal framework that failed to align with market economy regulations. Furthermore, the project suffered from a deficiency in technological support and proper organizational planning. Interesting to note is the approach of the ECB (European Central Bank), which acts with utmost care in regard to introducing a digital Euro[34]. Because it may have profound effects on the credibility of both the Euro and the European banking system. Concerns in implementation were drawn to the following:
1.The main emphasis is placed on the rate at which the digital Euro is adopted. An excessive uptake could pose a risk to financial stability, while a lack of widespread adoption may result in the central bank failing to maintain its own role.
 2. Euro banknotes and coins have a status of legal tender. However, the introduction of a digital Euro would require to harmonize the European legal framework in order to recognize the digital Euro as legal tender.

3. Another significant aspect concerns the choice between opting for a centralized or decentralized ledger system for the digital Euro. In a centralized ledger configuration, ownership of the digital Euro is registered within the (central) bank's accounts, and the European Central Bank (ECB) maintains records of digital Euro ownership in the names of the respective holders. In this scenario, users would rely on either the ECB or individual intermediaries to accurately document their ownership and manage transactions. Conversely, in a "distributed" ledger system, multiple entities would be responsible for maintaining ownership records in various ledgers. In this context, the accuracy of ownership records would be verified through a consensus among numerous separate ledgers, all indicating the same ownership and transaction details. This consensus mechanism has been favored for some privately-issued cryptocurrencies, primarily to eliminate the need to trust a single central entity for record-keeping.

[31] Alvarez F. E, Argente D. & Patten D. (2022, April 01). Are Cryptocurrencies Currencies? Bitcoin as Legal Tender in El Salvador. Becker Friedman Institute, Working Paper No.2022-54.
[32] Ibidem
[33]Marroquín T. (2022, September 01). Bitcoin and Public Finance in El Salvador. Friedrich-Ebert-Stiftung (FES) El Salvador https://library.fes.de/pdf-files/bueros/fesamcentral/19699.pdf
[34] Spitzer K. G. & Loi G. (2023, August). Digital Euro Reviewing the progress to date and some open questions. Economic Governance and EMU Scrutiny Unit (EGOV), Directorate-General for Internal Policies PE 747.848 -

Nevertheless, it remains uncertain how the ECB can ensure the achievement of its objective of maintaining "full control" over settlements in a distributed ledger system[35].

Portugal

Several blockchain systems were set up in public services, healthcare services and supply chain management in Portugal. The Blockchain Panorama Platform which was launched by the Portugues government in 2019, aims to ensure information sharing between cooperation using blockchain technology. There is a cryptocurrency-friendly environment in the country. The government facilitates and encourages digital money use. In many places, you can make transactions using cryptocurrencies. ATMs also recognize cryptocurrencies. You can also pay utility bills or taxes using cryptocurrencies. The Portuguese government also incentivizes blockchain investments and has adopted certain regulatory frameworks related to it as part of EU legislation.[36]

Singapore

Singapore stimulates investments in blockchain. It has a friendly regulatory framework for blockchain businesses. Initial coin offerings (ICOs) businesses are intensified in the country as a result of incentives and a favorable legislative framework. The Monetary Authority of Singapore also takes necessary steps to reduce blockchain-related risks. In addition, cryptocurrencies have been a popular payment method in the country. According to a recent survey, 58 % of its population uses cryptocurrencies for the transactions they make, which is quite a high number[37].

United Arab Emirates (UAE)

The UAE government initiated a blockchain strategy in 2018. In this strategy, it is aimed that all public and private organizations in the country benefit from blockchain technology. It is seen that public and private organizations have adopted this technology and can carry out transactions in a transparent and effective way using the decentralized system of blockchain technology. As a result of these efforts, Dubai was named as the "First Smart City on the Blockchain" in 2017. It means that many transactions made on paperwork can be carried out using blockchain technology. The Blockchain Challenge, the event in which different blockchain applications are demonstrated and tested, took place in Dubai in 2017, 2018 and 2019. According to the 2018 UAE Blockchain Strategy, 50 % of viable governmental transactions are planned

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[35] Kai Gereon SPITZER and Giacomo LOI (August 2023): Economic Governance and EMU Scrutiny Unit (EGOV) https://www.europarl.europa.eu/RegData/etudes/IDAN/2023/747848/IPOL_IDA(2023)747848_EN.pdf

[36] *Rodrigues B.A, Monteiro P. V., Domingos P. & Remetula A. (2020, September 15), Blockchain: Portugal. Law and Practice. Chambers Global Practice Guide. Telles Avogados https://www.telles.pt/xms/files/Global_Practice_Guide_Blockchain_2020_Portugal.pdf*

[37] *Monetary Authority of Singapore, (2020, 16 December). Singapore Blockchain Ecosystem Report https://opennodes.com/Singapore-Ecosystem-Report-2020.pdf*

to be carried out on blockchain systems by 2021. As of 2022, 1875 governmental services are offered using blockchain technology. [38]

Blockchain for SMEs in Italy

According to a report by the OECD[39], SMEs are the major business type in Italy. 99,9 % of businesses are established in the form of SMEs. 94.7 of businesses in the country employ less than 10 persons, namely they are micro-enterprises. And, 78,6 % of its workforce works in SMEs. SMEs in Italy are highly productive and play an important role in export activities. However,their digital transformation of production processes is lacking

For digitalization, in the first place, digital infrastructure is required. And for this, a high-speed internet connection is a must. Although Italian SMEs have access to the internet, its speed is rather slow. However, the gap in terms of high-speed internet is smaller between SMEs and giant companies than the OECD average. Along with it, Italian SMEs are in a leading position in terms of investment in ICT equipment, software, and databases. Italian SMEs also make investments in advanced technology. Nevertheless, they are reluctant to use some internet-based technologies such as cloud technology or big data and train their employees about ICT.

The Italian government put into action several policies to promote digitalization within SMEs[40] One of the initiatives in this regard is the "Industry 4.0 Plan.This program is still in place as of 2023, and the Italian government renews its targets and incentives every year so that SMEs can be equipped with the latest digital skills[41]As part of this program, certain guarantees are provided to increase their digital capabilities. SMEs can have access to long-term credits at mild interest rates if they want to make investments in digital technologies. MISE (the Ministry of Economic Development) also provides consultancy on how SMEs can be digitalized. Technological hubs also help SMEs in digitalization. Starting from 2019, MISE put into action programs aiming at the adoption of blockchain technologies in SMEs. If this technology is adopted by SMEs effectively, they can manage their data optimally, speed up their production processes and increase the quality of their products.

Despite these initiatives, adopting blockchain technology by Italian SMEs would be a hard and lengthy process for them. First, potential risks that may be caused by blockchain such as financial crimes or privacy issues should be considered. As a result, different Italian authorities have enforced different regulatory measures against these risks.

[38] Khan S., Shael M., Majdalawieh M., Nizamüddin M. & Nicho M. (2022, May 27). Sustainability 2022, 14, 6576. https://doi.org/10.3390/su14116576.

[39] Marco Bianchini and Insung Kwon, OECD (2020) "Blockchain for SMEs and entrepreneurs in Italy", SME and Entrepreneurship Papers No. 20 https://www.oecd.org/cfe/smes/Blockchain%20for%20SMEs%20in%20Italy.pdf

[40] *ibidem*

[41] Switzerland Global Enterprise. (2023, January 01). Italy : Incentives for Industry 4.0, https://www.s-ge.com/en/publication/industry-report/2023-e-mem-italy-c6-industry-40/italy-incentives-industry-40-0123/checkout

According to a survey in 2019, these are the major barriers to the adoption of blockchain by Italian SMEs[42]:

- Reluctance to replace existing systems with blockchain (30 %)

- Regulatory reasons (30 %)

- Security threats (29 %)

It should be also noted the weight of these barriers is lessened when compared to the results of the survey conducted in 2018.

Several projects are implemented in order for SMEs to benefit from blockchain. A list of such projects is shown in Table 3.

Table 3: Blockchain Projects for Italian SMEs

Project Name	Sector	Purpose
Anticipay	Financial services	To enhance the liquidity of commercial invoices
Bio Valore World	Biotech	To allow consumers to check if biodegradable plastics are used in products
Brandzledger	Manufacturing	To increase the traceability of products
EZ Lab	Agri-food	To certificate products in a way that consumers can reach every detail
Fluida	Business administration	To simplify Human Resources management

Source: OECD

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[42] Marco Bianchini and Insung Kwon, OECD (2020) "Blockchain for SMEs and entrepreneurs in Italy", SME and Entrepreneurship Papers No. 20 https://www.oecd.org/cfe/smes/Blockchain%20for%20SMEs%20in%20Italy.pdf

Now, let us give the details on one of these projects, EZ Lab[43]. This project uses the Ethereum infrastructure to digitalize the productive processes on the farms. Different actors in the supply chain can access the system. Certain criteria are entered into the system so that agri-food producers can get a certificate for a particular food. Producers have to meet these criteria in a digitalized way in the system. Once the criteria are fulfilled, the certificate is automatically issued in the system.

The EZ Lab project clearly shows that a certification process of food can be easily and successfully executed in a transparent, efficient, and speedy way without any middlemen who may corrupt the process and impair transparency, thanks to blockchain technology. It can be easily concluded from this example that other sectors will take advantage of blockchain technology to enhance their security, transparency, and credibility. The fields in which blockchain technology can be used include consulting, lending, marketing, human resources, real estate, insurance, supply chain, payment, digital identity, humanitarian aid, transportation, procurement, intellectual property, protocols, document authentication, medical research, and electricity[44].

It is seen that a majority of Italian SMEs have already started using blockchain software[45]. According to the survey results, of SMEs interviewed, stated that they had already started using blockchain software and 53% of them used them in their commercial process, 37% of them preferred using public blockchains, and 63% of them were planning to use private blockchains. And the majority of them believe that blockchain will enhance the security of and speed up their business processes.[46]

According to the survey results conducted on SMEs in Italy legal issues and complicated administrative procedures seem to be the biggest barrier to the adoption of blockchain technology by Italian SMEs[47] . The lack of clear basic guidelines regarding the use of blockchain discourages entrepreneurs from using this technology. Especially speculations around cryptocurrencies, as financial application of blockchain technology, in 2017-2018 and the ineffectiveness of existing laws such as KYC (Know Your Customer) and AML (Anti Money Laundering) rules and corruptive behaviors of administrations shed doubts on this technology.[48] To increase confidence, the Italian parliament enacted a set of rules. These rules define DLTs and smart contracts. According to the law enacted by the Italian parliament in 2019, DLTs are technologies and IT protocols operating on a distributed, decentralized, simultaneously accessible and replicable ledger. And, smart contracts are software operating on DLTs, which automatically give effect to the relevant terms of an agreement between two parties once the relevant ledger entry has been validated. Smart contracts have the same legal

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[43] Marco Bianchini and Insung Kwon, OECD (2020) "Blockchain for SMEs and entrepreneurs in Italy", SME and Entrepreneurship Papers No. 20 https://www.oecd.org/cfe/smes/Blockchain%20for%20SMEs%20in%20Italy.pdf

[44] *Ibidem*

[45] *Ibidem*

[46] These statistics can be viewed from the pages 42-44 "Marco Bianchini and Insung Kwon, OECD (2020) "Blockchain for SMEs and entrepreneurs in Italy", SME and Entrepreneurship Papers No. 20."https://www.oecd.org/cfe/smes/Blockchain%20for%20SMEs%20in%20Italy.pdf

[47] Marco Bianchini and Insung Kwon, OECD (2020) "Blockchain for SMEs and entrepreneurs in Italy", SME and Entrepreneurship Papers No. 20https://www.oecd.org/cfe/smes/Blockchain%20for%20SMEs%20in%20Italy.pdf

[48]*Ibidem*

effect as written contracts, provided that the digital authentication of the parties is performed in accordance with procedures set out by The Agency for Digital Italy[49].

The other legal challenge results from the requirement of compliance with GDPR privacy rules when using blockchain. Especially, there is complete confusion as regards the use of digital signatures.

2.3.2 Land Registries and corruption schemes in Uzbekistan

Blockchain technology can be used for any transaction involving value or asset transfer. Land registries, where complex paperwork procedures are dominant and which are open to corruption as land registry officials may exploit their positions for the unfair transfer of properties or may accept a bribe to speed up lengthy procedures, is one of the promising areas where this technology can be used.

Lands and real estate properties are one of the most precious assets anywhere in the world. Therefore, they usually become the subject of dispute in many countries. That is why governments subject their transfers to complicated procedures and lengthy processes. Consequently, property transfers are associated with heavy paperwork, strict rules, lengthy procedures, and unyielding officials. Yet, all these may give rise to the exploitation of officials and finding ways of legal implementation to speed up the processes or gain unfair advantages.

At this point, the digitalization of land registry transactions can be offered as a solution to speed up procedures without compromising security. However, unless a solid system can be established, digital data can be electronically tampered with, and modified data may be the source of corruption and unfair advantages. Here, the tamper-proof feature of blockchain among others may aid in establishing a solid digital system that will never give way to corruption and illegal activities over land registries.

The further implementation of the blockchain system in land registries has the potential to alter the roles and responsibilities of notaries and land registrars. In the existing system, notaries and land registrars are tasked with confirming the identities of the parties involved in transactions, validating documents and signature authenticity, and ensuring that the statements made by the transacting parties align with real-world facts and are willingly expressed. With the utilization of blockchain technology, there is a potential reduction in the need for intermediaries such as notaries and land registrars.[50] The blockchain system enables the creation of smart contracts that automatically enforce agreement terms upon meeting specific conditions. Consequently, the responsibilities of notaries and land registrars could transition from validating and executing contracts to verifying the identities of transaction participants and confirming the legal validity and enforceability of smart contracts. Blockchain technology's ability to

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[49] Riccardo de Caria (2020). Blockchain and Smart Contracts: Legal Issues and Regulatory Responses Between Public and Private Economic Law. The Italian Law Journal [Vol. 06 – No. 01

[50] Kaczorowska, M. (2019). Blockchain-based land registration: possibilities and challenges. Masaryk University Journal of Law and Technology, 13(2), 339–360. https://doi.org/10.5817/mujlt2019-2-8

create an unchangeable and indelible transaction record might not always meet the criteria for legal notarization or registration. A study carried out in Japan[51] introduces a distinctive application of blockchain technology in the notarization process, focusing specifically on Japan's notarial system. In this traditional system, notaries appointed by the Minister of Justice manually handle notarization, a known time-consuming and slow process. The study's main goal is to introduce a fully automated notarization system that relies on national eID cards for identifying individuals, particularly for fixed date notarizations. This system automatically verifies the creator and the document for electronically signed documents using national eID cards. It utilizes the blockchain-stored transaction receipt as a notarization certificate. Smart contracts within the blockchain perform data verification, eliminating the need for a verification authority. However, this approach may not be universally applicable to all notary systems, as it is most effective for fixed date notarizations and is not suitable for tasks involving document content or authenticity verification often needed in other notarization scenarios. Blockchain's impact on document validity in notarial or authentic form can vary depending on the specific notary system and the document type. This is because, while blockchain can securely record and confirm property ownership and transfers, it may not always grant the same level of validity as notaries or land registrars. Notaries and land registrars possess legal authorization for specific functions, such as verifying party identities, ensuring document legality, and recording transactions in public registries. Two notable limitations of this proposed method include its suitability only for fixed date notarizations and the fact that it solely stores a document hash on the blockchain, not the document itself. Therefore, customers may need to manage the document's preservation when necessary. It is also crucial to reconsider legal remedies related to land transactions that are considered void ab initio, such as in cases of fraud.[52] Typically, a void transaction is legally treated as if it never happened. In a hybrid blockchain land registration system, when faced with a void transaction, a court has two possible courses of action: (a) instruct authorized parties to acknowledge the return of the land token to the original owner, or (b) instruct authorized parties to reverse the unlawful transfer of the land token. While the latter option aligns more closely with the legal concept of void ab initio, it would necessitate reconstructing all the blocks dependent on the affected block, which might not be feasible due to the substantial computing power required. One of the principal legal ramifications entails a significant shift in the legal and regulatory framework governing such transactions.

Following features of blockchain technology can help prevent corruption in land registries[53]:

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[51] S. Haga and K. Omote, "Blockchain-Based Autonomous Notarization System Using National eID Card," in IEEE Access, vol. 10, pp. 87477-87489, 2022, doi: 10.1109/ACCESS.2022.3199744.

[52] Vincent OOI, (7-2022): Blockchain land transfers: Technology, promises, and perils
https://www.sciencedirect.com/science/article/pii/S0267364922000206

[53] **Abrams** E. (2022, August 17). "How European countries are using blockchain to reform the land registration process", Emerging Europe
https://emerging-europe.com/voices/how-european-countries-are-using-blockchain-to-reform-the-land-registration-process/

Decentralization: Even if one block of the system is tampered with by one node for a fraudulent purpose, the transaction will not be approved unless 51 % of other nodes verify it. In blockchain technology, the verification of a fraudulent transaction by 51 % of nodes is virtually impossible.

No intermediaries: There will be no need for officials who will do the paperwork. The transfer of the property is securely carried out according to the protocol pre-loaded in the system. As a result, it is out of the question that transactions will be corrupted by the officials.

Speedy transactions: One of the reasons causing corruption in land registries is the slow and lengthy process. This reason will be eliminated as a result of speedy transactions made electronically.

Traceability: In a blockchain system, every step of the transaction can be well-detailed. If the case of corruption occurs in a certain step, it can be easily traced, and culprit persons can be identified. , except for situations where the input data is incorrect. When we talk about blockchain and supply chain traceability, the question of "data accuracy" quickly comes up. Since data recorded in a blockchain cannot be modified afterwards (see our article on the subject), it is common to assume that recorded data must always be true, otherwise (garbage in) all traceability would be wasted (garbage out).

Identity of owners: As a common problem in land registries, it becomes impossible to find the identity of owners due to complicated processes. In a blockchain system, although the owners are anonymous, certain blocks can be linked to certain owners. Thus, property transfer to or from them can be conclusively proved.

Now, let us see the use of blockchain in land registries in different European countries[54].

The use of blockchain in land registries is pioneered by Sweden in Europe. Sweden started its first trials with blockchain in 2016. It was projected that the use of blockchain in the land registry system would remove paperwork, prevent illegal activities and corruption, accelerate the process, and save annually 106 million US dollars. Along with benefits offered by blockchain technology, it should also be noted that the process of using blockchain in land registries in Sweden became more problematic than anticipated.

Other countries investing in blockchain technology are Georgia and Netherlands. Georgia has been investing in blockchain technology since 2016. It is aimed to enhance the trust of Georgian citizens in the land registry and data security by using blockchain technology. Presently, the ownership of property can be electronically verified in Georgian land registries. And, The Netherlands initiated a comprehensive program investigating legal, economic and ethical aspects of blockchain use in land registries.

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[54]**Abrams** E. (2022, August 17). "How European countries are using blockchain to reform the land registration process", Emerging Europe
https://emerging-europe.com/voices/how-european-countries-are-using-blockchain-to-reform-the-land-registration-process/

The first study for this purpose, which aimed to assess the impact of use of blockchain on the real estate sector, was conducted in 2017. It was followed by other studies investigating different practices of blockchain use in land registries in the world. These studies led to the establishment of Foundation for International Blockchain and Real Estate Expertise (FIBREE) network in 2019. Presently, research on use of blockchain in land registries are being implemented under the supervision of FIBREE. Overall, after comprehensive research and practice the Dutch land registry decided not to use blockchain technology.

One of the other countries taking important steps in using blockchain technology is Uzbekistan. This country has put into action several projects to carry out digital transformation with the aid of the World Bank. One such project concerns the digitalization of land registries.

Uzbekistan was a former member of the Soviet Block, where individual ownership of property was legally prohibited. Private ownership started to be granted beginning in 1992. However, the system is inherently very slow and cumbersome, and corruption is widespread. The Government places trust in digitalization as the best solution for these problems.

The state land registry system can be described as following[55]: In Uzbekistan, it is only possible to own residential apartments, houses, or buildings. The ownership of buildings is separated from the ownership of land. In principle, as a practice stemming from the communist era, land could not be owned until the enactment of the Law on Privatization of Non-Agricultural Land Plots, dated August 13, 2019, which was updated with a new law enacted in November 16, 2021. Land can be only privately used for commercial and food security reasons, and the transfer of them is only possible for these purposes. It was also possible to lease land for agriculture, but the lessee could not transfer its right of use to third parties. According to this law, the following lands can be privatized[56]: (a) Land plots on which the buildings, structures and industrial infrastructure facilities of legal entities are located and the adjacent areas necessary for production, (b) land plots provided to citizens of Uzbekistan for individual housing construction and maintenance of a residential house, (d) vacant land plots and (c) land plots provided to the Urban Development Fund.

Transactions are made on paper and reception, registration, surveying, inventory and valuation, and archiving transactions are all made by hand. Applications are received and reviewed by a registrar, and then sent to the surveying department, and technical inspection is made there. The value department assesses the value of the property. The requested transaction is made and documented, and its records are kept in the archive, but all these are made on paper.

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[55] **World Bank** (2021, July 15). "Modernization of Real Property and Cadastre Project" https://projects.worldbank.org/en/projects-operations/project-detail/P151746
[56] Uzbekistan the Law on Privatization of Non-Agricultural Land Plots No. 3PY-728 (2021, November 16)

Although certain regulatory frameworks regulating land registry transaction exist and have been improved in time, they still have to be updated[57].

Goskomzemgeodezcadastre is a self-financed organization responsible for land registry and cadaster activities in the country. Within this organization, different registry books are kept. All records are manually registered in the books. There is a different book for cadaster records. Certificates documenting the ownership of the property are issued according to these books. There is no uniform application for drawing cadastral maps between different land registry offices. However, some registry offices began to use computers and relevant software for cadastral maps and other transactions[58]. Being far from international standards, these innovations have given rise to a partial betterment in land registry transactions. To give an example, the Tashkent land registry office has digitalized some of its services to meet the expectations of the market actors and for taxation needs. This office has 11 branches, and all branches can access the electronic database including land registry information, and registration, inventory, and valuation data entry are made using a special application. In the database, detailed information regarding the property such as their respective owners or owners' rights can be found starting from 1992, when private ownership was legally permitted in the country. A system is established between the land registry office and tax office for taxation issues. For cadastral works, advanced programs such as AutoCad, MapInfo and ArcGIS are used. Some other software is used for the location of plots and parcels. As a result, the transaction capacity of the office has been enhanced. It can finalize 500-600 residential property and 300-350 non-residential property transactions every day.

Despite the partial improvement in some offices, the land registry system is rather cumbersome and slow. It is far from securing the ownership rights of individuals. It is needless to say the system can be easily exploited by ill-intended officials and clients at any time. Thus, corruption will not be unthinkable in the system. Digitalization is a must along with other measures. An up-to-date legislative framework allowing digitalization is urgently needed. Land registry offices should be renewed and equipped with the latest technology. The staff should be trained on digitalization and be equipped with digital skills. Following these innovations, a blockchain system can be set up as part of digital transformation. The first concrete action taken by the Uzbek government for this purpose is the Presidential Decree issued in in July 2018. This decree envisages a vision guaranteeing transparency and accountability in land registries. The Uzbek government also declares its intention that it will collaborate with international organizations like UNDP, UNICEF or UNODC on the matter of use of blockchain in land registries.

The Uzbek government is determined to digitalize the land registry system using blockchain technology and works closely with the World Bank for this purpose*.* The World Bank is financing property and cadastral projects in this regard. One such project

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[57] **World Bank** (2021, July 15). "Modernization of Real Property and Cadastre Project"
https://projects.worldbank.org/en/projects-operations/project-detail/P151746
[58] *ibidem*

is the "Modernization of Real Property Registration and Cadastre"[59].The main purpose of the project is to ensure the transition from a paper-based system to digitalized system. The project is also aiming at these:

➽ Improving real property business by renewing and digitalizing real property registration and cadaster system.

➽ As a result of the project, it is aimed that all registration processes and cadastral processes be fully digitalized and electronically accessible by the public

➽ Improving the regulatory framework regarding real property registration and cadaster and solving operational problems related to them.

➽ Installing an infrastructure where spatial data can be accessed, shared, and exchanged at a national level.

➽ Pronouncing the importance of real property rights.

The details of the project can be summarized as following[60]:

Establishing a real property registration and cadaster system: An integrated information system will be developed for real property registration and cadaster. As a result, clients can access real property information and cadastral information in the system. Eventually, all real property and cadastral information on paper will be carried to the digital world. This will enhance the accuracy, quality, security, transparency, and efficiency of real property and cadastral records. All textual cadastral records, cadastral surveys, and plans can be found in the system. The system will be also connected to other systems and will be a unified and centralized system for real property and cadastral records. In the system, the loading, conversation, capture, exchange and dissemination of data will be possible. The system will serve as;

- a database management system

- a middleware between the data management system and clients

- a platform for the registry and cadaster application of clients

Ensuring the development of real property registration and cadaster data: All the data from archives will be digitalized, datasets will be formed, and these datasets will be harmonized. There will be both general datasets and classified datasets (like military data). Different datasets in different land registry offices will be also integrated. A high-resolution satellite image of Uzbekistan territory will be loaded into the system. All

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[59]**World Bank** (2021, July 15). "Modernization of Real Property and Cadastre Project" https://projects.worldbank.org/en/projects-operations/project-detail/P151746

[60] *ibidem*

rural and economic areas of Uzbekistan will be clearly seen on maps. These maps will be continuously updated, and changes in the spatial areas can be observed from the system. All relevant information related to apartments, buildings, houses, lands, etc. will be available on the system. Land plots and boundaries can be also clearly seen. Relevant information will be easily searched and found. The information will be frequently updated. Extracting documents will be also easy. The officials will be trained in this regard, and documents demanded by clients can be extracted in a short time. About 50 million handwritten reports will be digitalized.

Different land registry offices will use a unified system, and the system will be integrated with other online systems in the country. These steps will be taken to achieve this[61]:

- Geo-referenced and mosaicked satellite imagery of the territory of the country will be obtained.

- This data will be embedded in the land registry system and integrated with other systems.

- In the end, the base map will be able to serve for geo-referencing, indexing, mapping, and verifying the real properties and cadaster in the country.

Property and land use rights will be ensured:

- All residential places and land units will be uniquely identified, and detailed information such as property features, rights owners, land use rights, or legal burdens will be associated with each residential place or land unit.

- All residential places and land units can be viewed over maps by clients and related information can be seen by them.

- The online information related to residential places, which is obtained from paper sources, will be also verified through physical surveys in the territory.

Databases will be open to public use taking into account the data protection law, that does allow access to personal data with the consent of the subject or which is not subject to confidentiality requirements.[62]
- All the geospatial data in the system can be used by fiscal authorities, startups, government agencies, district administration,

property markets, and corporations.

- Information can be exchanged with the authorities stated above.

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[61] **World Bank** (2021, July 15). "Modernization of Real Property and Cadastre Project" https://projects.worldbank.org/en/projects-operations/project-detail/P151746
[62] LRU-547-сон 02.07.2019. On personal data. (n.d.). https://lex.uz/docs/4831939

- The system will be the sole platform where all information on real properties and lands in Uzbekistan can be searched, found and indexed.

The system will ensure effective communication with the users of the system and accountability:

- Effective communication with clients is crucial for the sustainability of the project.

- The system will be transparent and provide information to clients where necessary using different channels.

- In that way, the system can be protected against corruption.

- At times, the feedback of clients on how the system can operate more effectively will be compiled.

- At certain intervals, reports on the operation of the system will be published and disseminated to the concerned organizations and persons.

All these innovations in the land registry system will be crowned by use of blockchain technology. Especially, the transfer of the property from the seller to the buyer can and will be easily and securely handled via smart contracts operating on the blockchain system. The buyer and the seller can conclude an agreement on the system, and the transactions for transferring the property and payment can be made using blockchain technology. The transactions will be transparent, and all information regarding the property can be seen in the system.

In this way, there will be no intermediaries in the land registry system, which is the main source of corruption during the transfer of the property in Uzbekistan. The transfer transaction and payment will be transparent, definite and immutable. There will be no need for an officer and paperwork. Once the parties agree on the sales of the property, the transfer transaction can be carried out instantaneously. The payment will be also made in a secure and speedy way. In addition, taxes regarding the transfer of the property can be paid electronically.

If the blockchain project for the land registry system can be successful in Uzbekistan, it will be the exact solution for fighting against corruption in Uzbekistan. It will show how blockchain technology can play an essential role in speeding up processes by eliminating heavy paperwork , bureaucracy and eventually corruption, which is resulted from them.

2.4. Failed Example of Blockchain

In some cases, it is seen that blockchain technology can be used for odd purposes, as in the case of Venezuela. In fact, blockchain technology is a system that allows the value transfer of any commodity. The value of the commodity is reflected in cryptocurrencies, and the value can be transferred via the transfer of cryptocurrencies in a secure, transparent, and speedy way without the interference of intermediaries. When viewed from this perspective, Venezuela can be justified to offer a commodity with value to the open market. What is odd about this case is that blockchain technology is used to finance the debts of a country as a last resort. This section will have a closer look at this event, which is allegedly a failure of blockchain technology[63] [64].

It should be first analyzed the process of what caused Venezuela to take this action. Although Venezuela has rich petroleum resources, it has always suffered from economic problems. Maybe, politicians behave recklessly and waste their resources irresponsibly because they have overconfidence in petroleum. The story of Venezuela with blockchain technology started when Huge Chávez came to the office. At that time, petroleum prices were rising sharply, and Hugo Chávez, as an ambitious president, would like to channel the revenue generated from petroleum into social welfare projects. However, corruption was everywhere in the country. Chávez spent the revenue unnecessarily on for example controlling mass media. When Chávez died in 2013, the petroleum revenue had been depleted, and the democracy in the country was severely impaired. Then, the new President Nicolás Madura came into office, and the bad news was that petroleum prices were declining.

There was an oversupply of petroleum at that time, and Venezuela could not sell its petroleum. As a result, many people in the country became jobless. And, the government started to print great amounts of money, so the sharp rise of inflation was unavoidable. Eventually, the national currency was worthless, and people could not meet even their basic needs.

While all this happening, the US applied several sanctions on Venezuela and restricted its access to finance. The Venezuelans came up with an interesting solution to overcome the financial problem. They decided to capitalize on their only asset, petroleum, as a cryptocurrency using blockchain technology. This gave rise to the born of "petro" as a cryptocurrency. President Madura ordered the issuance of Petro at the beginning of January 2018. Each Petro would be the equivalent of the value of one barrel of Venezuelan petrol. The presale of Petro was launced on February 20, 2018 and continued until March 19, 2018. A total of 38.4 million Petro tokens were offered

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[63] Krygier, R. (2021, December 1). Venezuela launches the 'petro,' its cryptocurrency. *Washington Post*. https://www.washingtonpost.com/news/worldviews/wp/2018/02/20/venezuela-launches-the-petro-its-cryptocurrency/

[64] Brown, A. (2019, May 10). Venezuela's failed cryptocurrency is the future of money. *Bloomberg.com*. https://www.bloomberg.com/news/articles/2019-05-10/venezuela-s-failed-cryptocurrency-is-the-future-of-money

and the Venezuelan government alleged that[65] [1] they collected 3.3 billion US dollars by means of it. Later on, several problems arose. First, it was alleged that its white paper was conflicting. Ethereum Core developer Joey Zhou asserted that Petro was the clone of Dash. Second, the US government banned its citizens from buying Petro. Following this, Bitfinex declared that they would not support Petro. Despite all these, the Madura government continued their efforts to promote Petro.They especially incentivize the domestic use of it in Venezuela. For example, Venezuelan people were obliged to pay passport fees with Petro. Or they could pay their taxes with it[66].

Many were skeptical about the success of Petro. The country could not serve its outstanding debts, the inflation was at high levels, and petroleum was at the cheapest price. It was also argued that the government could easily manipulate it.

Others supported this initiative, arguing that Petro was backed by a government and a commodity with a value, and it would make it more stable relative to other cryptocurrencies.

If this initiative was to succeed, it might inspire other countries to take similar initiatives. It was also blamed that such practices were not in line with the logic behind cryptocurrencies. Despite all criticisms, the project was partially successful and solved the financial problem of the country, if temporarily.

On the other hand, it formed a new currency for Venezuelan people, with which they could make their exchanges without facing the inflation problem. It was far better than the national currency, which became completely worthless.

When viewed from this perspective, we can see how blockchain can be successful to prevent corruption and increase the credibility of an asset even in the example of a country full of corruption in hard financial conditions.
First, thanks to blockchain technology, the supply of cryptocurrencies can be fixed. The fixed amount of digital money is exchanged for certain transactions by the users of the blockchain system under the free market conditions. Second, there will be no central authorities like a Central Bank or government, which can interfere the supply and exchange of digital money. Third, as transactions made with the digital money on the blochain system will be transparent, monetary resources cannot be exploited by central authorities. All these will increase the credibility of the cryptocurrency as a medium of exchanging assets, which will eventually prevent inflation and corruption.

The decentralized, transparent, disintermediate, and immutable nature of blockchain technology makes cryptocurrencies more credible and stable unlike fiat currencies, which are more vulnerable to manipulation and corruption. The reason for this is that fiat currencies are under the control of a central power. Historically, it was seen that these powers exploited fiat currencies to consolidate their political power. They manipulated and corrupted fiat currencies in a way that they could finance their extravagant spending

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[65] Haig S. (2019, July 17). Venezuelan Petro Against US Sanctions: History and Use of the Crypto. Cointelegraph
https://cointelegraph.com/news/venezuelan-petro-against-us-sanctions-history-and-use-of-the-crypto
[66]*ibidem*

and buy off supporters for them. This problem could be only handled when the power of issuing money was given to an autonomous entity such as central banks, independent from central political power. The best of examples is Germany, which suffered from hyperinflation after the First World War but had the most credible fiat currency following the constitution of an autonomous entity responsible for controlling fiat currency. Such manipulation and exploitation are impossible with cryptocurrencies using a blockchain system. Because power is decentralized and transactions are transparent. The supply of digital money cannot be increased arbitrarily. It is also impossible to channel digital money into several users to the advantage of them. Digital money is only used to transfer value under free market conditions.It would be also true for all other assets and commodities.

Without a central power and intermediaries, asset transfer systems using a blockchain system cannot be manipulated and corrupted. In addition, assets can be easily monetized, transferred, and exchanged.

The case of Venezuela cannot and should not be deemed as the failure of blochain technology. Above, I only pointed out that this technology helped Venezuela to get out of a financial distress, if temporarily. It was later understood that Petro was only a deceptive or fraudulent activity by the Madura regime to maintain their political power. They stole codes of another cryptocurrency, misinformed the public and ignored all necessities required by blockchain technology.The actors of cryptocurrency markets clearly saw this and discarded Petro. The Madura regime just attempted to exploit a cryptocurrency, just as they exploited their national fiat currency, to attract some foreign finances. If they had truly created a digital money operating on a blockchain system, there would have been more confidence in their digital money, both nationally and internationally.

3.1. Using Blockchain in the Fight against Corruption in Uzbekistan

Uzbekistan is one of the former Soviet Union countries. Due to heavy bureaucracy, corruption has been prevalent in the country. Although the Uzbek government has taken certain steps to prevent corruption, it cannot eradicate its corrupted image in its people's perceptions. However, this image can be improved by digitalizing bureaucracy by means of blockchain technology. Digitalization will enable the direct receipt of governmental services. It will minimize human intervention and ensure the smooth execution of services[67].

The following benefits are expected as a result of digitalization:

➥ There will be more trust in the government.

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[67]**Andriaen** C. & Dimovska M. (2022, August 26). "Blockchain for more transparent public services in Uzbekistan", UNDPhttps://www.eeas.europa.eu/delegations/uzbekistan/blockchain-more-transparent-public-services-uzbekistan_en\

➥ It will change the perception of corruption in the country.

➥ It increases the quality of public services.

➥ It will ensure transparency.

➥ Inequalities within the country will be reduced.

➥ Eventually, it will help sustainable development.

To achieve the goals stated above, a project involving digitization and the use of blockchain was put into action with the collaboration of the European Union, the United Nations Development Program (UNDP), and the Ministry of Justice of the Republic of Uzbekistan[68].

A comparative approach to the implementation of blockchain around the world is essential for providing valuable insights to other countries seeking further implementation. After discovering partial success in some countries, there are instances when blockchain, despite several attempts to establish robust legal frameworks and effective technical planning, remains primarily as a record-keeping innovation. It does not consistently deliver the enthusiastic results initially envisioned when proposing blockchain as a tool to eliminate intermediaries and combat corruption. Sometimes, it can be disheartening for enthusiasts to encounter failed models of usage, as was the case in El Salvador. While technical concerns can be adequately addressed and planned by experts, the transition is often a challenging and lengthy process. Established actors may be resistant to change or adopt it slowly. Countries exercise caution in implementing blockchain, as they are wary of risking their current systems for a new, enthusiastic idea that has not yet proven its ability to function well after years of investment and implementation. However, blockchain excels in record-keeping, reducing human involvement not only in land registries but also in various other fields. Uzbekistan is actively working on implementing widespread blockchain practices and has introduced specific reforms and initial steps to establish a legal framework for this purpose.

Blockchain technology introduces several novel concepts such as encryption, smart contracts or digital identity. The legal system should be adapted in a way that will recognize these concepts. Apart from this, digitalization entails the enforcement of regulations on subjects such as digital crimes, digital identity, and compliance with certain digital standards.

For the success of digitalization in Uzbekistan, the existence of a legal framework is essential. First of all, legislation to govern digital services should be introduced. Second,

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[68]**Andriaen** C. & Dimovska M. (2022, August 26). "Blockchain for more transparent public services in Uzbekistan", UNDP https://www.eeas.europa.eu/delegations/uzbekistan/blockchain-more-transparent-public-services-uzbekistan_en\

some rules should be laid down regarding the grounds, procedures, effects, and consequences of smart contracts and internet protocols. Third, the consequence of the digital transfer of assets should have the same effect as a physical transfer. Finally, financial acts that will constitute a financial crime and their punishments should be coded.

Recently, Uzbekistan has adopted certain reforms in the fight against corruption.These reforms also address certain issues related to the formation of the necessary legal framework and infrastructure for digitalization (therefore including the use of blockchain) in the fight against corruption:[69]

Formation of anti-corruption policy[70]: Until recently, Uzbekistan lacked an anti-corruption policy that could combat corruption effectively. The Law On Combating Corruption came into force on January 4, 2017. Among others, this law stipulates the control of governmental bodies by civil society, systematic review of governmental affairs and broad access to information held by governmental organizations. All these entail digitalization and the use of blockchain technology.

E-government [71]: The Law On e-government was adopted in December 2015 and entered into force May 2016. The Government Protocol No. 7 was adopted on the formation of databases of state bodies in the Unified Register of Electronic State Services on February 23, 2016. The Registry is located on the Unified Portal of Interactive State Services (UPISS). There, public institutions providing digital services and digital procedures for the institutions can be found. the Cabinet of Ministers adopted a Resolution "On Measures to Improve the Procedure for Providing Electronic Public Services" on June 2, 2016 to offer high-quality public services and improve electronic procedures. This regulation expects governmental agencies to remove bureaucratic barriers, speed up transactions and reduce costs using digital tools. The Resolution of the Cabinet of Ministers "On Further Measures to Implement the Law of the Republic of Uzbekistan" enables to regulate the provision of electronic public services through Single Portal of Interactive Public Services (SPIPS). Now, all types of registration, permitting and licensing procedures can be implemented at the SPIPS in the open access. The Resolution of the Cabinet of Ministers of the Republic of Uzbekistan on measures to create an Interdepartmental e-government data transmission network requires entities providing electronic governmental services to connect with Interdepartmental e-government data transmission network. Thus, the integrity of e-governmental services can be ensured. Payment for e-governmental service is made possible through the new version of SPIPS 2.0. As of 2017 8 electronic services rendered by 2 437 state bodies are offered on the portal (my.gov.uz).[72] Starting from 2018, presidential decrees resolutions, orders and protocols are electronically distributed to governmental agencies. An electronic document management system "E-Nazorat" ("e-control") is set up for customs authorities for the transparent and timely

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[69] OECD. (2019). Fourth Round of Monitoring Uzbekistan
https://www.oecd.org/corruption/acn/OECD-ACN-Uzbekistan-4th-Round_Monitoring-Report-2019-ENG.pdf
[70] *ibidem*
[71] *ibidem*
[72] Website for public services: https://my.gov.uz/en/tourism/inde

execution of documents.As of 2019 more than 2 million applications have been processed, over 48 thousand users have been registered and more than 120 public services have been introduced in the new version of interactive public services (my2.gov.uz).[73] Different official documents (such as certificates, licenses or extracts) can be formed on the portal. This completely makes it unnecessary to visit public offices for obtaining paper versions of these documents. In addition, taxes can be electronically paid, and the results of audits and licenses processes can be electronically followed up.

Since 2017, Uzbekistan's government has formulated and enforced the necessary legislative framework for the smooth operation of blockchain technology in the country. Crypto assets and crypto trading are legally allowed in Uzbekistan. Mining crypto currencies, making smart contracts, and issuing, exchanging, storing and disturbing crypto assets are free in the country. National Agency for Project Management (NAPM) under the Uzbek presidency is authorized to develop digital economy and implement policies to promote blockchain technology.

NAPM enacts and enforces the relevant laws and bylaws for blockchain technology. The most important regulation in this regard is Digital Economy and Blockchain Technology Act, This act defines the basic concepts of blockchain, set a solid ground for it and set out liabilities for the illegal use of blockchain. Legally, cryptocurrency transactions are free from taxes. Uzbek legal system grants certain privileges for systems using blockchain technology.

3.2 The reasons of using blockchain in this fight

Since blockchain does allow for the possibility of exchanging and executing smart contracts without the need for intermediaries, it effectively reduces the human factor. This advantage makes it highly valuable for promoting further implementation in the fight against corruption, a problem that persisted for many years during the Soviet Union.
To begin with, Blockchain systems can still be vulnerable to manipulation and corruption. However, achieving such manipulation is more difficult and resource-intensive in practice. The expenditure of these resources does not necessarily result in greater advantages or additional resources. Once specific parameters are loaded into the system, they cannot be arbitrarily changed. Consequently, there is minimal room for corruption, and transactions adhere to the pre-loaded parameters. Secondly, the distributed and decentralized nature of blockchain significantly reduces the possibility of fraudulent actions within the system. Even if one node attempts fraudulent activity, other nodes quickly detect it and may prevent it. The system remains under constant scrutiny by users due to its transparency and accessibility. Importantly, blockchain transactions are immutable; they cannot be altered retroactively. Therefore, modifying a transaction to gain an unfair advantage is not easily achievable, which simultaneously serves as a disadvantage of the system. It is worth noting that even in the full implementation of blockchain in land registries or other fields, humans will still

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[73]Website for public services: https://my.gov.uz/en/tourism/inde

play a coordinating role. This means that oversight is required in case of incorrect data entry and the subsequent retrieval or adjustment to address inaccuracies. More specifically, as a former Soviet country, it takes some time for Uzbekistan to get rid of the heavy corrupted bureaucracy and cumbersome operation of governmental agencies. No matter how well intended the top administration will be to take actions in favor of its people, the bureaucracy will resist these actions and want to maintain their old habits. On the other hand, the people will see that they can easily have access to governmental services via electronic means. For example, they can obtain licenses, permits or certificates instantly from the online system, whereas they had to wait for months for the same transaction. As a result, they will start to believe that they will receive governmental services directly without being dependent on the bureaucracy. All these will decrease level of corruption in the country.

The ownership of real property is of particular importance in Uzbekistan. Because the old communist system permitted such ownership for only residential purposes and agriculture. Enterprises could not own land for production. Even if trade, entrepreneurship and property ownership were liberated after the collapse of the Soviet Union. The owning and transfer of property was rather difficult and gave way for corruption and bribery. All records of the land registry were on paper and insufficient. To overcome these obstacles, the government enacted the law permitting the private ownership of lands. In that way, enterprises were able to own land where they performed their production. Individuals were able to build or own a residence on their own land. The second step taken by the government was to digitize all the paperwork and land register services. Thus, people were able to access information regarding their properties. They were also able to carry out certain transactions electronically.The third revolutionary step by the government is to use blockchain technology in land registries.The absolute success of implementing blockchain in its full functionality cannot be guaranteed, and the outcomes will become evident after several years of utilization. Nevertheless, it is certain that the record-keeping and archival capabilities of blockchain will provide advantages, contributing to a reduction in corruption and bureaucratic inefficiencies to some degree. All these revolutions in land registries will ultimately to an enormous amount limit the cases of corruption in the country.
 More governmental services are being provided electronically in Uzbekistan, and in some services, blockchain technology is used. It means that anyone having an electronic device with a simple internet connection can handle its official transactions without middlemen and waiting time and free of charge. All these are revolutionary steps that would minimize corruption in many fields forever.

3.3. Why is Uzbekistan a promising field for blockchain operation and crypto market?

Uzbekistan ought to promptly shed the perception of being a corrupt country, as any state in the world, Uzbekistan aims to enhance the welfare of its people and has taken certain actions to succeed. However, they partially failed due to high levels of corruption in the country. Human involvement becomes unavoidable in the presence of intermediaries. Consequently, the digitization and use of blockchain technology seem to be the best way to prevent middlemen abuse, human interference, and corruption.

The ultimate aim of the Uzbek government is to digitalize all government services and use blockchain technology for them[74]. It started applying this innovation to the civil registry[75]

Table 4: Illustration of how blockchain technology work on the civil registry system

Functions	Blockchain Network	Notes
- Create a birth certificate	Creates	-While creating, updating or validating a birth certificate, digital fingerprints called hashes are automatically created.
- Update a birth certificate	Validates	- Hashes are encrypted, so they are far from being stolen and used, Everything is beyond the human control and automatic.
- Validate a birth certificate	Updates	Transactions are transparent and can be checked by the users of the system.

Source: UNDP

Other fields where blockchain technology will be used are school certificates and land cadaster[76]:

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[74] **Stragegeast** (2019, January 04). "Uzbekistan to introduce blockchain technology in all government agencies"https://www.strategeast.org/uzbekistan-to-introduce-blockchain-technology-in-all-government-agencies/
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School certificates: In Uzbekistan, it is not uncommon to issue false school certificates. The existing system does not allow to trace who is responsible for false certificates. They are not recorded in a central system. They are only kept at schools and can be changed easily, and false ones can be produced. From now on, the certificates will be issued by a blockchain system where the necessary information will be loaded. This system will be transparent, and it will be known who issues the certificate, how it is certificated, and how a certificate is issued. Anyone can access their own certificates.

Land Cadaster: All documents related to lands on paper based registry will be digitalized and can be accessed by the public. All information related to a property or land will be available to concerned persons. The selling or buying of real property or land assets can be performed using blockchain technology. The correctness of the transaction can be easily checked over this system. The fraudulent transactions and the corruption of officials can be easily detected in this way. The holders of properties can also check the records of their properties. This system will be also supported by regulatory frameworks.

The ultimate aim of Uzbekistan is to digitalize any government service in the long run. Blockchain technology will be used to electronically render these services. If Uzbekistan is to succeed in this project, it can get rid of the burden coming from the communist regime, which is heavily bureaucratic and full of corruption. No paperwork and intermediate officials will be needed to make the transactions. The government can also control and supervise the services it gives. If any corruption happens at any stage of the service, it can be easily detected and responsible persons can be identified.

All these will considerably reduce costs, speed up transactions, enhances reliability and security and wipe off corruption. There will be a transition from a cumbersome economy to a dynamic economy. Economic and civil activities will be performed more confidently, there will less legal disputes, and the general welfare of society will increase.

If the blockchain project can be successful in Uzbekistan, it will show how blockchain technology can transform a country. The lack of intermediaries, transparency, decentralization, and distributed verifications of transactions means no bureaucracy, no corruption, no lengthy procedures, and a cumbersome process. Every legal transaction can be made electronically in a secure, transparent, effective, and speedy way. The progress of transactions can be easily monitored on online systems. Potential misconduct can be easily identified, challenged, and punished.

4. Conclusion

In the last couple of decades, we have witnessed major digital transformations, which significantly change lifestyles and business models. Blockchain technology is one of these transformations whose effects we will see in the long run.

Blockchain is a decentralized network where the transactions are verified by the consensus of the majority of its members. Therefore, it is hardly possible to conduct fraudulent activities over the network. Suspicious transactions can be easily detected and prevented.

The use of blockchain made cryptocurrencies possible. However, it can be used in any field that involves value transfer. Its main advantage is that it ensures the direct transfer of assets without intermediaries, who may exploit and corrupt transfer transactions. For that reason, it can be a viable way of fighting against corruption.

Uzbekistan, as one of the former members of the Soviet Union, has been suffering from corruption resulting from heavy bureaucracy coming from the old regime and non-digitalized governmental services. Although the Uzbekistan government has taken several steps to fight against corruption, it has not been successful to date. In the end, it is decided that the digitalization of governmental services is the best solution for this.

Uzbekistan is planning to digitalize and use blockchain technology for all governmental services with the collaboration of international organizations like the EU and UNDP.

First trials in this regard are being made on civil registries, school certificates, and land registries. The upcoming results look very promising, but whether or not this project will be successful will be seen in the long run. If it succeeds, it will be the best evidence of how a blockchain can transform a country from being highly corrupted to highly transparent.

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