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# **Tokenization of Valuable Papers: New Possibilities for Application of Blockchain on the Stock Exchange**

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**ABSTRACT:** This article explains the innovative aspect of the technological platform used to transfer securities from one party to another, called the Blockchain. Blockchain avoids banks or other intermediaries and allows parties to transfer funds directly to each other using a peer-to-peer system. This breakthrough technology did for money transfers what email did for sending mail—eliminated the need for a trusted third party, just as email eliminated the need to use the post office to send mail. This technology, primarily used for peer-to-peer money transfers, can also be expanded to perform other forms of transfers. Blockchain technology can be used to buy and sell shares. Real world shares can be tokenized into digital shares that can be easily transferred using a peer-to-peer network. These digital shares act in a similar way to digital currency, the price of which changes in real time and fluctuates. Shares traded entirely peer-to-peer can solve many of the problems that the stock market faces today, including high-frequency trading and short selling.

**KEY WORDS:** Blockchain technology, The digital economy, Hash, Proof of Work (PoW), Transactions, Block, Distributed ledger, Peer-to-peer (P2P).

## **I.INTRODUCTION**

One of the most well-known definitions of blockchain created by Don and Alex Tapscott is "Blockchain is an incorruptible digital ledger of economic transactions that can be configured to record not just to financial transactions, but almost anything of value" [1].

The technology behind various digital currencies is blockchain. Bitcoin is a digital currency. Bitcoin does not exist in a physical form, like various currencies and coins made of metal and paper. Instead, it is stored in electronic devices and secondary storage devices such as a hard drive, etc., in digital form. This digital form acts as an advantage, allowing them to be stored, transferred, bought and sold entirely online using the blockchain. These transactions can take place entirely peer-to-peer, meaning without the help and verification of a trusted third party such as a bank or broker [2].

However, despite its broad advantages, Blockchain technology is far from perfect and, like any breakthrough technology, has its advantages and disadvantages in its implementation. The following are some of the pros and cons of blockchain implementation (Figure 1).

**Pros of blockchain technology**

- Setting the stage for micropayments in the world of the Internet of Things
- "Smart contract" system, which allows to exclude a person from control of payments
- Possibility of creating a new "exchange", without an owner, and therefore without commissions
- Full decentralization of payments reduces the likelihood of hacking and makes transactions more transparent
- Reduced transaction costs
- Data safety. Duplication of data among the participants in the transaction allows you to reduce or even eliminate the loss of information about the payment during the transaction

**Cons of blockchain technology**

- The need to adapt the legislative framework
- Energy consumption. At the moment, the use of many blockchain networks implies the presence of large computing power.
- Blockchain scalability problem. At the moment, the size of one block does not exceed 2 MB [4], which makes it possible to protect networks from hacker attacks, but reduces throughput
- The emergence of Mempuls, the so-called delayed transactions, confirmation of which has yet to come from the miner
- The possibility of using blockchain for illegal fraud

**Bilateral approach**

- Immutability of information. As mentioned earlier, blockchain technology is far from perfect, so it is not immune to errors, and the fact that the information contained in blocks is inviolable is a serious problem in the face of these possible errors, since this information cannot be changed.
- Anonymity. This feature has also been used even to commit illegal activities as it makes transactions impossible to trace.

Figure 1. Advantages and disadvantages of blockchain technology [5; 11]

The operating principles of the blockchain consider the above benefits and drawbacks (Table 1).

Table 1. Operating rules for the blockchain system [6]

<b>Operational principles</b>	<b>Description</b>	<b>Problem being fixed</b>
No intermediaries	The blockchain employs numerous algorithms and a unique consensus process in place of third-party entities to carry out transactions.	Increasing the frequency of information exchange and transaction speed



Enhanced privacy and data protection in new data analytics	The use of blockchain technology enables automatic information exchange between counterparties regarding the transaction and all essential data.	Allows you to prevent possible errors and deliberate fraud against one of the parties
Eliminate hacking	Data distribution and decentralization via the blockchain, as well as additional levels of protection provided by cryptographic encryption	Increases transaction protection and reduces the risk of the financial system
Mechanisms for exchanging digital currencies	Blockchain enables you to more successfully launch a crypto currency supported by fiat money	Reduces central banks' mutual settlements and improves cross-border communication

**II. OPPORTUNITIES OF BLOCKCHAIN TECHNOLOGY**

Blockchain can be used in a very wide range of areas and this is ensured by a number of possibilities of this technology.

***Check transactions***

Transactions in the blockchain are collected into one large block, to be included in the block, must go through the stage of checks approved by consensus, as well as approved by all participants of the chain.

***Uniqueness***

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***Security***

Financial institutions and other industries need privacy and confidentiality of transactions. It can be argued that in many cases secrecy is not really necessary and transparency is preferred instead. For example, bitcoin does not require privacy; however, in some scenarios it is desirable. Data privacy in Blockchain can only be ensured by external means. Blockchain itself is public.

***Cryptocurrency***

The system can generate cryptocurrency as a reward for miners who verify transactions and spend resources to ensure security.

***Immutability***

Once an entry is added to a block, it cannot be changed or deleted. It is possible to undo the changes, but this is considered almost impossible, because it requires an irreplaceable amount of resources for computing resources. Therefore, you should be careful when adding information to it.

***Smart-contracts***

Smart contracts are automated, self-contained programs that reside on a blockchain and contain business logic and code to perform a desired function when certain conditions are met. Such contracts provide flexibility, programmability, and control over the actions blockchain users must take according to their specific business requirements. [7]

In other words, with the help of blockchain, it is possible to create a digital, binding contract between two entities. Because of the covenants, they do not require as much trust as an unconscionable agreement. The contract is open to the public and fully transparent, so both parties know what they are agreeing to.

All this is the logic of programming. The results are predetermined in the contract, they depend on the actions of the parties participating in the smart-contract. When both parties fulfill their obligations, the contract will know what steps will be taken. In order to ensure security, both parties to the contract may require the performance of obligations to ensure the performance of the contract. Smart-contracts are able to automate processes and simplify operations. Currently, most of the use of smart contracts is related to financial services, but smart contracts can also be used for business activities such as ownership interests, voting, audits, document registration, auctions, etc. can cover many types. One of the main advantages of smart-contracts is to remove the middleman from the transaction process. The first application of



blockchain technology, perhaps without realizing its true potential, is cryptocurrency. The real benefits of Blockchain have been realized with applications in many different industries. Since then, several options have been proposed for the use of blockchain technology in various industries, including finance, IoT (Internet of Things), digital rights management, government, environment, and transportation.

#### ***Internet of Things (IoT)***

The Internet of Things, or IoT for short, has become very popular recently due to its potential to transform business applications and everyday life. IoT can be defined as a network of computationally intelligent physical objects that are able to connect to the Internet, perceive events or environments in the real world, react to these events, collect relevant data and transmit them over the Internet. This simple definition has a huge impact and has led to amazing concepts such as smart homes, smart grids, smart cars and smart cities based on this basic concept of an IoT device. Blockchain technology is beginning to play an important role in the IoT by improving security, enabling low-cost device connectivity, and facilitating device control for decades to come. [8]

For example, the location and temperature of a package connected to IoT with blockchain can be updated and tracked as it moves through multiple distribution points. This helps all parties share information and package status during delivery to ensure compliance with contract terms.

There are three main advantages of using blockchain in IoT:

- **Building trust** - between all parties involved in the transaction. Person A may not know device B. But the records of transactions and data stored in the blockchain create trust between the parties.
- **Reduced costs** - Participants can reduce the cost of monetary and time commitment as it removes the middleman from the process. Transactions are now based on citizen-to-citizen services, eliminating most legal or contractual costs.
- **Acceleration of transactions** - increases the number of transactions as intermediaries are removed from the process. Smart contracts can reduce the time it takes to fulfill a legal or contractual obligation.

#### **Government**

Various blockchain applications are currently being explored to support government functions and take the current e-government model to the next level. Some prominent features include e-voting, border control and e-ID. Let's see how some countries are using blockchain in this field. For example, Estonia is a leading country in adopting blockchain technology. Citizens and e-residents of Estonia can use a variety of public services using a cryptographically protected digital identity card. Citizens can check records stored in government databases and control who has access to them thanks to the blockchain platform. Recently, Nasdaq successfully completed a court case in Estonia, and as a result, the company's shareholders can use the blockchain voting system.

Estonia is also introducing blockchain technology in the healthcare sector. There are 1 million medical records that need to be secured. Every update and access to health records is recorded with the blockchain. This prevents medical fraud and prevents hackers from hiding or destroying information. With blockchain-powered real-time warnings of attacks, governments can respond to incidents before massive losses occur.

#### **Finance**

Blockchain has many applications in the financial sector. Major banks and financial institutions are researching ways to adapt blockchain technology, especially because of its much-needed potential for cost savings. However, developers have already developed solutions to protect private key holders and blockchain assets. For example, all parties in the chain may agree that a majority of parties must sign before mutual agreement. This prevents hackers from changing ownership by simply stealing a single key. Such multi-signature transactions can be programmed directly into asset trading applications running on the blockchain.

### **III. METHODS**

Many years after the release of Satoshi Nakamoto's white paper entitled "Bitcoin: A Peer-to-Peer Electronic Cash System" that initiated the invention of blockchain technology, blockchain is still a very young technology with low mainstream adoption and innovative solutions to everyday problems. Since then, blockchain has become widespread in various fields such as finance, railways, the energy sector, etc. One useful application of blockchain technology in the financial sector will be the stock market.



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The most profitable way to use blockchain technology in exchange trading is to speed up the settlement of these transactions. Traditionally, securities traders, representatives, and brokers have to go through a cumbersome and costly process that typically takes three days or more to complete an exchange - due in large part to the work of delegates, freedom of exchange transactions, and administrative procedures. Blockchain technology can greatly improve the efficiency of stock trading through automation and decentralization. Blockchain technology can also help with fundraising and asset management, as well as margin financing, post-trade settlement, securities lending tracking, and systemic risk monitoring. Ultimately, this can also help reduce customer costs and, in some cases, eliminate the need for a middleman entirely. Major current challenges, especially in cross-border payments and trade finance, can be addressed with blockchain-based solutions that reduce the number of intermediaries needed and are geo-agnostic. Basically, it allows you to trade any stock owned by any stock exchange or country as long as you are connected to the blockchain.

Blockchain is gradually being adopted by leading exchanges as a possible security solution. NASDAQ has led the way in implementing blockchain for stock trading. ASX (Australian Securities Exchange) has also replaced CHES (Clearing House Electronic Sub-Registry System) with blockchain through the end of 2021 for clearing, settlement and other possible exchange transactions for Australian shares. In an effort to cut costs, HKEX (Hong Kong Exchanges and Clearing) is looking to adopt blockchain and is now working with ASX to share their experience with blockchain so far. The London Stock Exchange (LSE) is also actively moving towards the use of blockchain. In July 2018, the LSE teamed up with technology behemoth IBM, considered one of the world's pioneers in providing open source blockchain solutions. These stock exchanges aim to provide ease of use, transparency and cost reduction to encourage investors and traders to trade more actively. These stock exchanges also aim to reward those investors and traders based in other countries who are geographically restricted and unable to invest and trade stocks owned by other countries and stock exchanges.

## IV. RESULTS

Digital shares are tokenized versions of shares. In fact, one token is equal to one share. For example: 1 share of Quartz (#KVTS) = 1 digital share of #KVTS. In many cases, owners of digital shares are entitled to receive dividends that are paid out to shareholders. These digital shares are also known as equity tokens in blockchain technology.

### ***What are equity tokens?***

Equity tokens function like a traditional stock asset. A share token represents a share in the underlying company [7]. As with any stock purchase, the owners literally own a percentage of the entire enterprise. They are entitled to a share of the company's profits and the right to vote on its future. The only significant difference between a share token and traditional shares is the way ownership is registered. A traditional share is registered in a database and may be accompanied by a paper certificate. The share token registers corporate property on the blockchain. The tokens are based on the blockchain and are issued on various blockchains such as Ethereum. Digital shares or equity tokens can be traded when the stock exchanges are closed because the tokens themselves are not listed on stock exchanges such as the NYSE or NASDAQ. Most likely, the tokens are in a cryptographic or digital asset, the exchange of which is usually open 24/7. Equity tokens open up new trading opportunities as they allow investors to access different markets around the world that they may not have had access to. For example, an Uzbek trader who does not have access to shares of US companies such as Apple can now invest in the company through digital shares.

### ***What is stock tokenization?***

Tokenization is the process of converting the rights to an asset, such as stocks, bonds, etc., into a digital token on the blockchain [8]. Financial intermediaries and technologists around the world are showing great interest in innovating how to move real-world assets to blockchains in order to reap the benefits of Bitcoin while maintaining the characteristics of the asset.

### ***Why tokenize stocks?***

Our world is full of assets: stocks, real estate, gold, carbon credits, oil, etc. Many of these assets are difficult to physically transfer or separate, so buyers and sellers instead trade in securities that represent some or all of the assets. But paper and complex legal agreements are cumbersome, difficult to communicate, and difficult to track. One solution could be to move to a digital system similar to bitcoin, but linked to an asset. Stock exchanges have largely phased out physical papers, replacing them with electronic transactions and standardized agreements, but the overheads of these systems are enormous and they tend to rely on trusted participants and exchange boards to regulate the smooth functioning of trading.



In the same way that you can buy a fraction of bitcoins, it will be possible to buy a fraction of digital shares, even if in the real-world shares are bought in whole numbers.

***An example of how digital stocks can solve the problem of traditional stocks***

When an investor wants to buy or sell shares, he can do so through a stockbroker. A stock exchange broker works on a commission basis, which is basically a percentage of the assets involved in trading, whether shares are bought or sold. A database is kept of the owners of the shares, and they are updated after the transaction is completed according to a long protocol that must be followed. This may take several days.

Let's imagine that Aziz sells #KVTS shares worth 3500 UZS and informs the stock broker of his intention to sell them, and also agrees to pay a brokerage fee of 2%, which is 70 UZS. Then the broker finds a buyer for the shares and informs him about the price of the shares and his commissions (commissions are presented in Table 3). The buyer agrees and pays 3500 UZS to the seller and 70 UZS as a commission to the broker. The broker of the stock exchange receives 140 UZS just for helping the buyer and seller make a deal. In some cases, millions of shares can be bought and sold, and in such cases, brokers receive hundreds of thousands (millions) of net profits only as commissions at the expense of buyers and sellers. This transaction may also take several days for the transfer of ownership of the shares and the electronic certificate of ownership of the shares.

Table 2. Commission fees in the securities market of the Republic of Uzbekistan

No	Name of commission on the securities market of the Republic of Uzbekistan	Percent
1	Broker commission	up to 2% from the seller up to 2% from the buyer
2	Commission RSE "Tashkent"	0,45 %
3	Commission fee of SE "Central Securities Depository"	0,05 %
4	Government duty	0.01% of sales

**Source:** developed by the author based on the analysis of legislative acts

Now, imagine that traditional stocks have been replaced by digital stocks. The buyer and seller can perform peer-to-peer transactions without the need for a stockbroker, bank or any other financial institution to act as an intermediary. The brokerage commission charged is retained by the buyer and seller. Digital shares can be easily transferred over the blockchain without much time consuming. Because blocks keep an accurate and immutable track, ownership of digital shares can be tracked at all times. So, Aziz could directly send a digital share through the blockchain to Otabek without paying a commission for trading.

This speaks to a nascent token economy where shares will be tokenized using blockchain technology. It is predicted that the market for tokenized assets will be \$24 trillion in financial assets in 2027 alone [9]. This includes tangible assets such as listed shares, unlisted shares, etc., as well as intangible assets such as patents, copyrights and trademarks. The first company to offer digital shares is DX Exchange, which is an EU-regulated cryptocurrency and digital shares exchange powered by NASDAQ.

## V. DISCUSSION

### A. NASDAQ [10]

In 2015, the NASDAQ selected blockchain startup Chain as a pilot to test the trading of shares in private companies, which are not publicly traded and involve a lot of paperwork. In October 2015, NASDAQ introduced Linq, a solution that allows private companies to digitally represent share ownership using blockchain-based technology.

The open-source Chain blockchain platform allows financial institutions to securely and almost instantly transfer money and other digital assets. The goal was to test the blockchain on the NASDAQ Private Market, a marketplace for trading shares of private companies before an IPO. NASDAQ conducted a pilot project with five clients. At the time, NASDAQ officials said the manual process of tracking stocks could be cumbersome and costly.

Taking it one step further, in May 2015, NASDAQ teamed up with Citi to announce an integrated payment solution that uses a distribution ledger to record and transmit payment instructions based on the Chain blockchain technology. This meant that investors on the NASDAQ could use Citi's cross-border payment mechanism and the blockchain to buy, sell and settle private securities transactions. Integration could allow exchanges such as the NASDAQ to address private securities liquidity issues by facilitating payment transactions between multiple parties.





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Meanwhile, NASDAQ has been at the forefront of a number of additional blockchain initiatives. In 2015, NASDAQ also expressed interest in developing an electronic voting system for its Tallinn Stock Exchange in Estonia using blockchain technology. NASDAQ has been working with the Estonian government to pilot blockchain-based electronic voting for shareholders to have their say at corporate annual general meetings (AGMs). By choosing the open source blockchain platform of its partner Chain, NASDAQ also leveraged the digital identity solutions used by the Estonian government to issue IDs to foreigners as part of its e-Residency program. Later, in 2017, NASDAQ successfully completed a test that allowed investors holding shares in the Tallinn Stock Exchange to vote online during annual general meetings or transfer their voting rights to a trustee.

As a result of the project, NASDAQ now has a working PoC (proof-of-concept) that can identify citizens based on their Estonian digital identity – either their Estonian identity card or e-resident card.

According to a NASDAQ report, general shareholder meetings tend to be costly events with little shareholder participation. As cross-border investment grows, so does the demand for a secure, cost-effective and flexible solution that can facilitate remote shareholder voting. Although some investors may delegate their vote by proxy to a custodian bank, they will not be 100% sure that their vote was placed the way they wanted. Thus, NASDAQ saw blockchain as an opportunity to improve the interaction between corporations and investors. In addition, creating a low-cost solution with easier access will allow foreign shareholders to exercise their voting rights, which could lead to further growth in cross-border listing, trading and settlement activities. Using secure blockchain technology, exchanges can give voters more control over their voting rights and easier access to their voting history.

## **B. LONDON STOCK EXCHANGE GROUP [10]**

In 2017, the London Stock Exchange Group (LSEG) partnered with IBM to create a blockchain-based platform for the digital issuance of SME shares in Italy. The project was built and tested by Borsa Italiana, part of LSEG. Traditionally, information for shareholders of small and medium-sized enterprises (SMEs) has been manually stored in spreadsheets or even paper records, with each shareholder having their own version of the information. Conversely, information recorded in a shared digital ledger can be viewed by everyone on the network and can only be changed with the consent of each party. Creating a golden data source can reduce the need to reconcile information held by different companies.

Storing shareholder information in a shared digital ledger should make it easier for SMEs to interact with their shareholders and provide more transparency to investors about their ownership. Another benefit could be that blockchain helps SMEs gain greater access to credit.

It could also be an important step towards being able to digitize real stocks as well as future debt. The impact on company financing can be huge, especially for small private companies. Improved liquidity could make these investments more attractive to investors, and the exchange itself could have lower administrative costs and more transparent oversight.

The role of stock exchanges in supporting SME growth was explored in a recent WFE-UNCTAD report. The report noted that SMEs face significant constraints, including lack of access to finance. The World Bank estimates that 70% of SMEs in emerging markets do not have access to credit. The WFE-UNCTAD report goes on to note that initial and ongoing compliance requirements and costs in traditional equity markets may represent a barrier to listing SMEs. This has prompted politicians, regulators and exchanges to develop regulatory regimes and platforms suitable for SMEs. Some earlier publications have criticized the success of these “junior exchanges” due to low demand and low capital raised. However, the number and scale of SMB platforms have grown significantly over the past 12 years, with over 7,000 companies listed on various SMB platforms on WFE member exchanges in over 40 countries as of the end of 2020. SME markets promote and support the listing of SMEs not only by facilitating access to capital, but also by creating an environment that allows SMEs to thrive, including eliminating or reducing listing fees, offering business development assistance, and ensuring less frequent reporting requirements.

By testing new applications for blockchain technology, LSEG can further boost SME listings on the stock exchanges and improve their access to the capital they need to grow.

## **VI. CONCLUSION**

Regardless of how the stock markets work now or not, this article offers an alternative form of trading that solves some of the current problems of the traditional stock exchange. Using Bitcoin's underlying technology - Blockchain -



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issuers will be able to tokenize shares that will allow anyone to buy, sell and see every transaction as it happens, removing some of the veil of secrecy surrounding much of the high-frequency and dark trading going on today. This alternative marketplace will also allow traders to trade completely peer-to-peer, eliminating several layers of intermediaries, including stock exchanges, brokers, and transfer agents. The bottom line is that the digital stock market will not require the replacement of the traditional stock market; rather, it will be an alternative market for users dissatisfied with the current regime. It is likely that both systems will always be needed, just as with the advent of email, there is still a need for a post office to manage traditional letters.

## REFERENCES

- [1] Tapscott D., Tapscott A. (2016) Blockchain Revolution. An imprint of Penguin Random House LLC.
- [2] Miraz M., Donald, D. (2018) Application of Blockchain in Booking and Registration Systems of Securities Exchanges. International Conference on Computing, Electronics & Communications Engineering (iCCECE).
- [3] Lee, L. (2015) New Kids on the Blockchain: How Bitcoin's Technology Could Reinvent the Stock Market. SSRN Electronic Journal, 2015.
- [4] Data from the information and statistical resource blockchain.. <https://www.blockchain.com/charts/blocks-size>
- [5] Arefyev, P.V., Voskanov, A.S., Grishin, M.S. (2019) Blockchain technology in the financial sector of the economy. №10 (66).
- [6] Kovalchuk. A.V., Saibel N.Y. (2018) Blockchain Technologies in the Financial Sector of the Economy: Advantages and Problems of Use. Concept Magazine. 6 p. (in Russian).
- [7] Sam Reed. (2019) Equity Tokens vs. Security Tokens: What's the Difference? Retrieved from: <https://www.bitcoinmarketjournal.com/equity-token/>
- [8] Addison Cameron-Huff. (2017) How Tokenization Is Putting Real-World Assets on Block chains., Retrieved from: <https://www.nasdaq.com/article/how-tokenization-is-putting-real-worldassets-on-blockchains-cm767952>
- [9] Finoa. (2018) The Era of Tokenization — market outlook on a \$24trn business opportunity. Retrieved from: <https://medium.com/finoa-banking/market-outlook-on-tokenized-assets-ausd24trn-opportunity-9bac0c4dfefb>.
- [10] Applications for blockchain. <https://www.unpri.org/sustainable-financial-system/stock-exchange-innovation-applications-for-blockchain/3597.article>
- [11] Advantages and disadvantages of blockchain technology.(2020) <https://magazine.decenter.org/ru/1-blokchein-i-kriptovalyuty/2-preimushstva-i-nedostatki-tehnologii-blokchein>