Blockchain technology as an entrance to support the digital economy and its most important challenges - the global blockchain market as a model -

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Abstract: With an emphasis on the prospects it offers for the growth of the digital economy, This research aims to provide an overview of the general structure of blockchain technology and its uses within the finance industry. In this document, we examine blockchain-related studies carried out between 2018 and 2022. According to the study, blockchain has the ability to drastically alter the financial services sector and give businesses a completely new method of conducting business. Recommendations for further blockchain technology research are also provided in light of this study.
Key words: blockchain technology, digital economy, cryptocurrency; database.
Jel Classification Codes : O32, G35

Introduction:

In the last decade, blockchain has been a widely discussed subject in the academic research. Researchers have been leading the conversation on the significant opportunities and impacts of this innovative technology on the developed nations.

Technically, the term "blockchain" refers to a data structure that stores information in blocks that form a chain linking new blocks to previous ones.

Bitcoin's founder, Satoshi Nakamoto, first used the phrase in his article "Bitcoin: A Peer-to-Peer Electronic Cash System" on October 31, 2008. Nakamoto explained that blockchain technology is used to create a digital version of cash that is transferred between two entities without a third party acting as an intermediary and attesting to its authenticity. Party to act as an intermediary and certify the transaction. This was a radical change from the prevailing transaction model, in which a trusted third party (typically a bank) was essential to validate the legitimacy of a transaction.

Blockchain technology is used to create specific types of distributed databases that consist of unchangeable data blocks. Each block includes a transaction list and a distinct reference to the previous block. Governments, technology developers, and private investors are increasingly focused on and interested in blockchain technology.

Research problematic:

To expand in the aspects of this research, we formulate the study problematic as follows:

How can the blockchain technology improve its potential applications in the digital economy?

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The research's central hypothesis revolves around the use of the blockchain system in the field of the digital economy and the fortification of the institutional regulatory framework around this technology.

Research objectives:

In general, the study aims to examine the potential and difficulties of blockchain technology. Nonetheless, the study's precise goals are to:

- Describe the Blockchain's operation;
- Evaluate the technology's potential and prospective in the global market;
- Assess the main obstacles to this technology globally, including both technical and business model obstacles.

Research plan:

This paper will start with some definitions and overview of blockchain. Then, in order to increase our knowledge on this issue, we will describe and analyze the case of using this technology in the economic and financial sector. Lastly, our research will end with some results.

1. Blockchain's historical context

The first popular digital currency, bitcoin, was confidentially presented in a whitepaper7 in 2008, and it immediately attracted the interest of a number of internet forums. This was mostly because it offered a working payment system test product that would allow mutually distrusting parties to quickly and safely reach an agreement over previous transactions and asset conditions without the use of reliable intermediaries.

In some distributed ledgers, a "blockchain" is a specific data structure that stores and sends data in blocks linked together in a digital chain. Using cryptographic and algorithmic techniques, Blockchains record and synchronize data across a network in an unchangeable way.

Blockchain, a specialized form of Distributed Ledger Technology (DLT), employs advanced cryptographic and algorithmic techniques to establish and authenticate a constantly expanding, append-only data structure. This structure, known as the blockchain, consists of a series of interconnected 'transaction blocks' that collectively function as a comprehensive ledger. (nternational Bank for Reconstruction and Development, 2017, p. 01).

Via cryptographic technology, a blockchain is a distributed, decentralized track, or "ledger," of trades that are kept permanently and nearly unchangeable. The blockchain may provide better transparency, immutability, and auditability because of its intrinsic distributed network and consensus mechanism qualities. (Wang & Han, 2019, p. 62)

The researchers posit that blockchain functions as a decentralized public ledger, documenting all transactions within its network. Data blocks are merged to create an extensive chain, hence the name "blockchain." Its applications include data storage, transaction facilitation, and the support of cryptocurrencies.

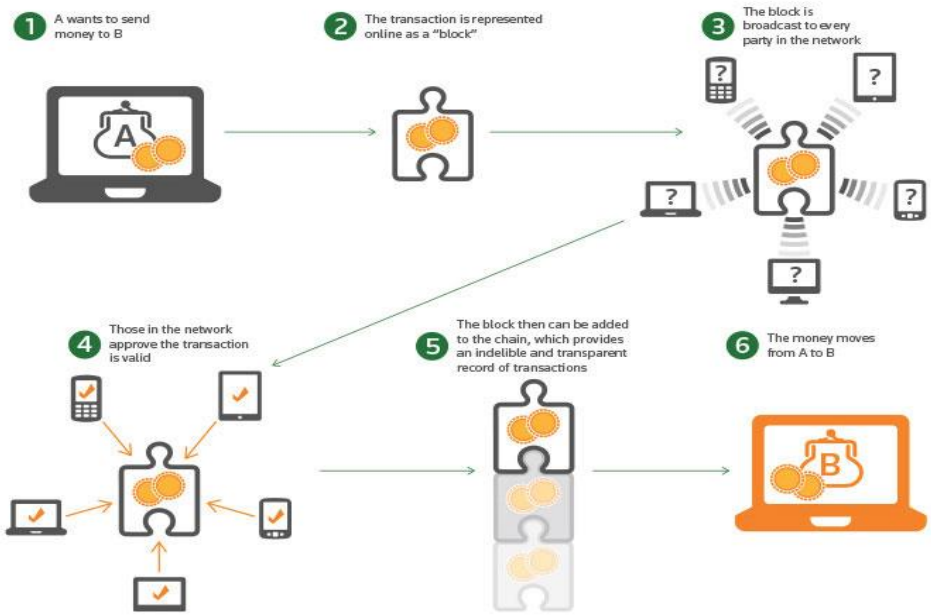
2. Blockchain’s process

Blockchain technology centers on the network as a whole. For instance, as depicted in figure 1, when an individual wishes to transfer funds to another personAll users in the network are then able to view the " transaction block , " which is then added to the existing blocks representing similar transactions . Each block contains a digital signature, timestamp, and

pertinent details, and together They create an extensive link, which is why it's referred to as "Blockchain." The origins of the chain trace back to the very first block ever created.

A block cannot be added to the chain if it isn't approved by the network or lacks a valid reference to the preceding block. (Huhmo, 2017, pp. 07-08)

Figure 01: how does a blockchain work?



Source: available at https://www.leverege.com/blogpost/blockchain-explained

3. Blockchain Benefits

Blockchain is a technological revolution that could lead to significant, constructive change. Blockchain has the potential to transform a wide range of applications and sectors, from smart insurance contracts and storing data in a decentralized, tamper-proof ledger to tracking finances and inventory and speeding up transactions.

Among the most important benefits of this technique, we mention the following:

New Business Value: Blockchain can assist create more effective corporate models by enhancing supply chains, accelerating international transactions, and enabling safe data management through distributed ledgers.

Lower risks: When creating transactions, use a distributed, permissioned, and immutable ledger. Customize digital agreements known as smart contracts to expedite and automate procedures including money settlement, ID verification, and dispute resolution.

Reliable ecosystem: Build a network with more accessible, dependable, and tamper-proof data. On the network, partner transactions can be tracked and audited. This fosters a trusting environment with suppliers, consumers, and partners.

4. Types of blockchain

Under the straightforward name "blockchain," other varieties differ in terms of decentralization level and other factors. Blockchains can be classified as following:

4-1- Public Blockchains

In an open platform, processes are open to the public, no particular organization or institutions oversee the platform, and members can remain anonymous. A single choice grants any user exceptional permissions. As a result, it is an entirely trustless system since it depends on the devices reaching an agreement before any data (transaction record, block, etc.) is put on the ledger rather than a trusted entity validating the transactions. (Ganne, 2018, p. 09)

4-2- Private Blockchain

When it comes to private blockchains, permission is required before whoever can get into the network. Furthermore, it is only slightly autonomous because a single body that the other users really trust governs it. (Ton, 2022, p. 15)

While only a tiny percentage of servers do transaction verification, a private blockchain can execute transactions with greater velocity and effectiveness than a public blockchain while consuming significantly less processing power.

4-3- Permissionless and permissioned Blockchains

The fundamental difference between permissioned and permissionless systems lies in the accessibility of the platform. A permissionless blockchain is characterized by the absence of access restrictions, allowing any individual with a computer to participate freely, a permissioned blockchain, on the opposite way, restricts access. Depending on the platform's features—specifically, whether it is public, consortium, or private—access can be limited at several levels, including the ability to read data, propose new transactions, and validate existing ones.

Although permissionless Blockchains, like bitcoin, make the updates, permissioned Blockchains constitute the foundation of many blockchain-related applications in international trade, such as trade verification.

Table 01: Main differences between public/permissioned Blockchains

	'Public' (open) Blockchains	Permissioned Blockchains
Central party	No central owner or administrator	Has some degree of external administration or control
Access	Anyone can join	Only pre-selected participants can join the network
Level of Trust	Network members are not required to trust each other	Higher degree of trust among members required (as collaboration among members could alter the ledger)
Openness	Ledger is open & transparent - shared between all network members	Different degrees of openness and transparency of the ledger are possible
Security	Security through wide distribution in a large scale network	Security through access control combined with DLT in smaller scale networks
Speed	Slower transaction processing restricts transaction volume	Faster transaction processing allows for higher transaction volume
Identity	User identity anonymous or protected by pseudonyms	Identity verification typically required by owner/administrator
Consensus	Difficult proof-of-work required as consensus mechanism	Variety of consensus mechanisms possible (typically less difficult & less costly than proof-of-work in permissionless blockchains)
Asset	Typically: native cryptocurrencies. But implementations are possible where a token is used which can represent any asset.	Any asset
Legal ownership	Legal concerns over lack of ownership as no legal entity owns or controls the ledger	Greater legal clarity over ownership as owner/administrator is typically a legal entity
Examples	Bitcoin, Ethereum	R3's Corda, Hyperledger Fabric

Source: World Bank group, Distributed Ledger Technology (DLT) and Blockchain, USA, 2017, P12.

5- The reality and importance of using blockchain in activating the digital economy

A fundamental element driving both economic growth and societal transformation is the digital economy. The rise of the Internet and the World Wide Web, along with the advent of electronic commerce, commonly referred to as "e-commerce," is raising important questions regarding its effects and assessments..

5-1 - Digital economy context

The digital economy is promoting the expansion of digital enterprises. The term "digital economy" was first introduced in the writings of Tapscott (1996), who argued that it encompasses not only the interconnection of machines but also the generation of wealth and societal advancement, along with the facilitation of human connections through technology.

The digital economy is fundamentally established through digital technologies, which were referred to as the "IT/ICT sector" during the 1970s and 1980s. According to the OECD, information and communication technologies (ICT) encompass a blend of manufacturing and service industries that facilitate the electronic capture, transmission, and display of data and information. (OECD, 2002, p. 20)

5-2- Network effects of the digital economy

When a product or service's value (or usefulness) rises in proportion to its user base, this wonder is known as organize impacts. There are two sorts of arrange impacts within the advanced economy:

- **Direct network effects:** occur when each user of a network gains advantages from the inclusion of additional users of the same category within that network. A pertinent illustration is the telephone, where the value a subscriber receives from the service increases as more individuals are likely to be connected. (Nicolas & al, 2015, p. 03)
- **Indirect network effects:** In contrast to the conventional paradigm of a single seller and several buyers, indirect network effects happen, when various user categories communicate on platforms that bring combined various actor kinds, such as many buyers and many sellers.

5-3- Integrating blockchain technology in digital economy

Blockchain can be applied to a wide range of fields and sectors, including as voting, supply chain management, digital identity, alimentary security, real estate, patents, cryptocurrency banking, and stock markets.

Blockchain has the ability to drastically alter the financial services sector and give businesses a completely new way to run their business.

These use cases are among the few of the numerous possibilities.

5-3-1 Capital Markets

Decrease settlement time and expenses by removing a single point of failure with distributed utilities. Reduce counterparty risk and increase operational efficiency by modernizing processes.

5-3-2 Payments and Remittance

Peer-to-peer sharing, excellent security, independence, and affordable transaction processing fees can all help speed up payments, particularly international transactions.

5-3-3 Trade Finance

To make the trade process more efficient, eliminate third-party functions and paperwork. Maintain single copies of documents current for maintaining digital business in the future.

5-3-4 Banking sector

Banks have begun investigating blockchain applications. For them, the idea of lowering transaction costs is very important. According to a well-known bank, Santander, using blockchain may save over $20 billion a year. Blockchain technology would remove handling fees and intermediary costs for both the bank and the user in banking. To reduce the likelihood of failure, blockchain technology must be implemented globally for its application in banking to be successful. Transactions typically take too many days to complete today, but with blockchain technology, they might be finished in a matter of hours or even minutes or seconds, and neither the user nor the bank would incur significant fees. (Huhmo, 2017, p. 12).

5-3-5 Smart Contracts

Digital agreements known as "smart contracts" are self-enforcing or make breaching them extremely costly. The technology is particularly suited to support smart contracts because a blockchain may function as a shared state system without the need for an outside party that can be trusted.

The conversation around smart properties gives rise to a broad understanding of blockchain-based smart contracts. Contracts, often known as smart contracts, refer to blockchain transactions that involve more than just buying and selling money; they may contain more complex instructions. Formally speaking, a contract is a way to use Bitcoin to create agreements with individuals using the blockchain. (Swan, 2015, p. 16)

6- The current state of blockchain applications in the global marketplace

Blockchain technology is a key component of several global business sectors' regulatory processes. Global investments in blockchain technology solutions totaled $11.7 billion in 2022. For investors, blockchain offers a big early-stage opportunity.

By the end of 2024, companies are estimated to have spent close to $19 billion on blockchain applications worldwide, up more than 50% from 2020. (New IDC Spending Guide, 2023)

The objective of the index presented below is to monitor the market fluctuations of a portfolio comprising international blockchain technology companies. On a business day at the pertinent hour, the index value is determined using the following formula:

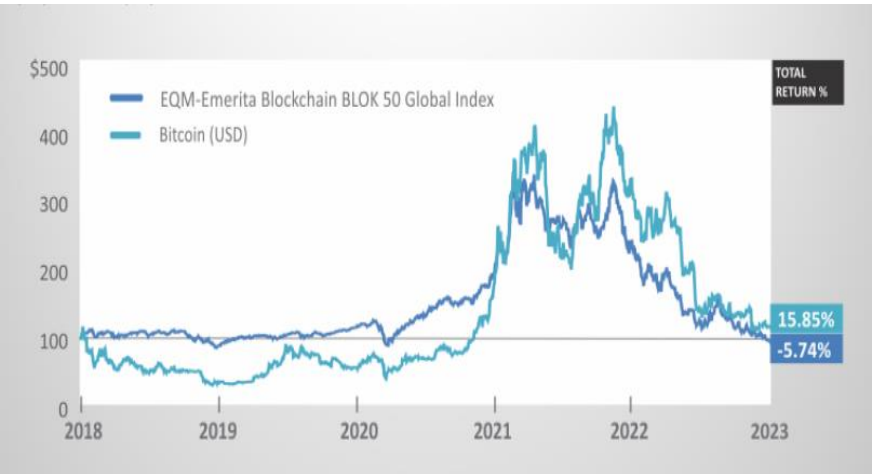
$$Index_t = \sum_{i=1}^{n} x_{i,t} * p_{i,t}$$

With:

$x_{i,t}$ = Number of Shares of the Index Component i on Trading Day t

$p_{i,t}$ = Price of Index Component i on Trading Day t in Index Currency

Fig (02): blockchain global index performance of some world companies from 2018 to 2022

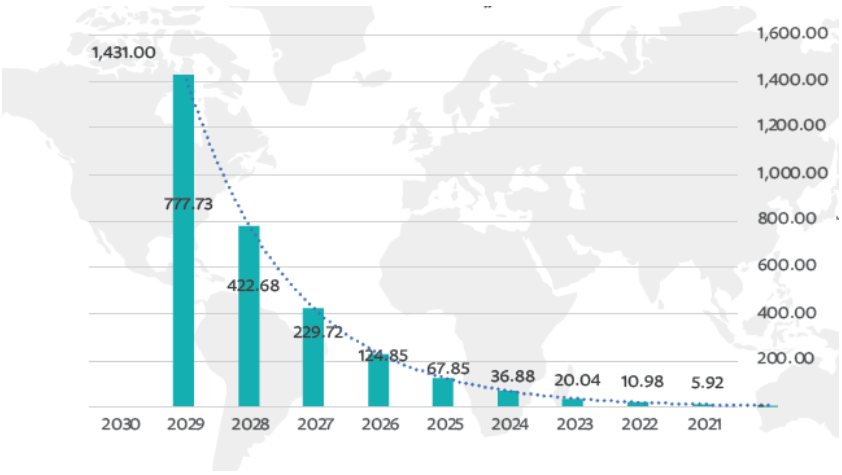


Source: BLOK 50 Global Index Fact Sheet, EQM indexes, available at: https://eqmindexes.com/blockchain-index-infographics/

However, since blockchain technology manages databases more flexibly than existing systems, it can drastically lower banks' infrastructure expenses by 30%. According to expectations, 55% of healthcare applications will use blockchain technology by 2025, and the total amount spent on incorporating blockchain technology into the healthcare system is anticipated to reach $5.61 billion.

As seen in the following figure, the blockchain technology market was valued at 5.92 billion dollars in 2021 and is projected to rise at a cumulative growth rate of 84% until 2030, when it is predicted to reach 1.431 billion dollars.

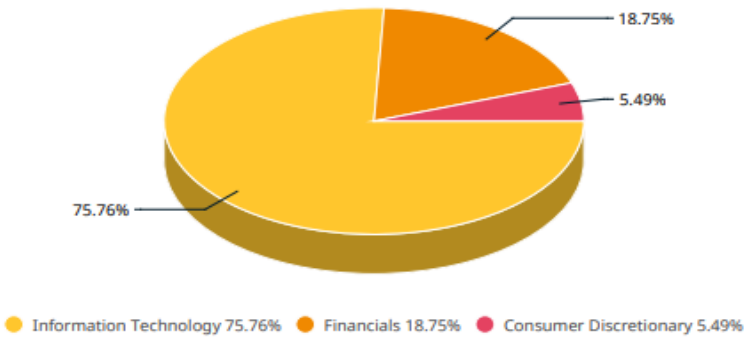
Figure 03: The size of the global market for blockchain technology



Source: report of Small & medium enterprise general authority, the technique of blockchain and its future on the Saudi Arabic, P15.

With a rate of 75.76%, the information technology (IT) services sector leads the global blockchain technology market. The financial services and digital economy sectors follow with a share of 18.75% and 18.75%, respectively. This is a significant percentage when compared to other sectors where the use of this technology is less than 6%., which is mention in the figure below.

Figure (04): The distribution of blockchain sectors in 2022.



Source: MSCI ACWI IMI Blockchain Economy Index, index factsheet, 2023, P02.

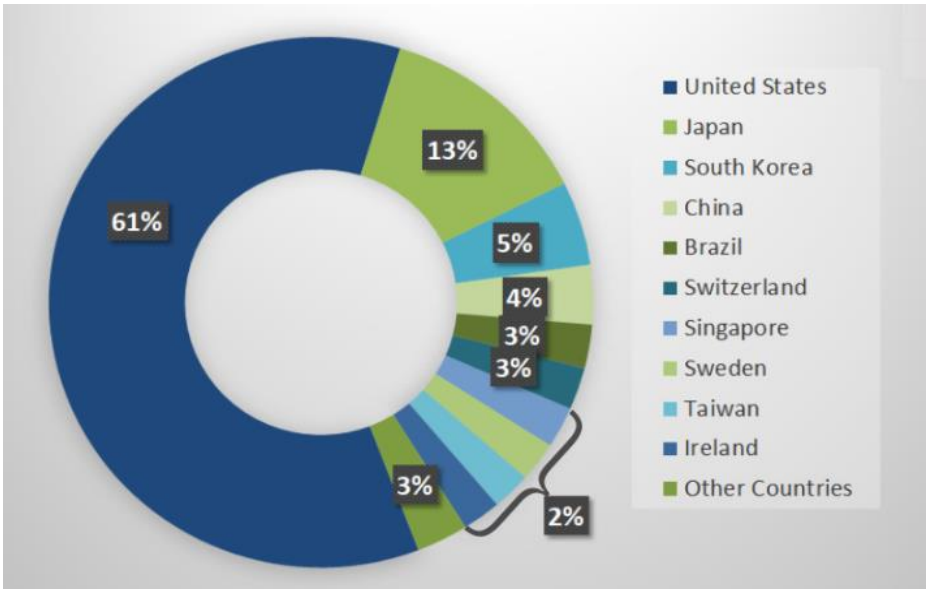
Blockchain represents a technology that has emerged recently. Nonetheless, throughout the next five to ten years, this fundamental technology has the potential to upend a variety of sectors.

As can be seen in the figure below (Fig 05), the United States of America has the greatest percentage of blockchain technology users (61%), primarily because plenty of companies adopt this technology in their transactions. Japan comes in second with a rate of 13%.

In a statement issued in June 2017, Japan's Ministry of Internal Affairs and Communications announced their intention to test a blockchain-based system for handling public bids.. (Ivan Martinovic, 2017, p. 14)

After incorporating blockchain technology into its "Thirteenth Five-Year Plan," the Chinese government announced intentions in 2016 to begin utilizing it for tax collecting and invoicing. In 2022, the country's adoption of blockchain technology increased by 4%.

Figure (05): blockchain's country weights in 2022



Source: BLOK 50 Global Index Fact Sheet, EQM indexes, available at: https://eqmindexes.com/blockchain-index-infographics/

7- Challenges of the blockchain technology

Because the blockchain sector is still in its infancy, there are numerous obstacles to overcome.

This technology encounters several challenges.

7-1- Technical Challenges

Several technical challenges associated with blockchain technology encompass:

- **Scalability**: Many blockchain networks' present infrastructure is not able to manage large transaction volumes.
- **Regulation**: Governments find it challenging to uphold laws and safeguard consumers in the digital economy due to the absence of a clear regulatory framework for blockchain technology.
- **Transparency:** Blockchain technology provides complete visibility of transactions through a single duplicate maintained in a distributed ledger across a network. The extent of visibility into the transaction history is contingent upon the permissions granted

within either a private or public blockchain network. Historically, business networks involving multiple participants suffered from a lack of transparency. Transactions conducted on a blockchain are neither hidden nor altered in any way. For any entry to be accepted and uniformly recorded across all ledgers, consensus among the network participants is required. As a result, whenever a modification or deletion occurs within the network, a record is generated detailing the time and the individual responsible for the change. (Pajunen, 2022, p. 24)

- **Interoperability**: Different blockchain systems use different protocols and standards, which makes it difficult for them to interact with each other in the digital economy. (nternational Bank for Reconstruction and Development, 2017, p. 18)
- **Security**: In the digital economy, blockchain technology is susceptible to hostile attacks, hacking, and other types of cybercrime.
- **Adoption**: Due to a lack of knowledge, technological knowledge, and infrastructure, blockchain technology has been weak to become widely accepted in the digital economy, despite its potential advantages.
- **Energy consumption**: In the digital economy, blockchain networks may need a lot of processing power, which might be energy-intensive.
- **Usability**: It may be challenging regular consumers to comprehend and make use of blockchain technology in the digital economy due to its technological complexity.
- **Privacy:** Protecting user privacy in the digital economy might be difficult because certain blockchain systems are made to be visible.
- **Integration**: It can be challenging and time-consuming to integrate blockchain technology with current digital economy systems and procedures.
- **Cost**: A blockchain system's implementation and upkeep can be costly, and both of organizations and individuals may have to pay hefty upfront fees to use the technology in the digital economy.
- In addition, the blockchain might reduce demand and expedite trade procedures in contrast to conventional payment methods. The primary cause is the decline in centralized service providers' costs. In the context of international trade, the removal of documentation results in large savings. The unchangeable shared ledger of the blockchain guarantees substantial cost savings. (Chang & al, 2020, p. 16)

7-2- Business model challenges

Business models represent an additional recognized functional and technical challenge. The core concept of decentralized peer-to-peer models is predicated on the absence of intermediaries who would otherwise extract a portion of the transaction or impose fees. (as in one conventional business model), traditional business models may initially seem inapplicable to Bitcoin. Nevertheless, in the emerging blockchain economy, there are still a lot of valuable revenue-generating goods and services to offer. (Swan, 2015, p. 85).

Conclusion

Blockchain was initially created for the digital currency bitcoin, its numerous applications in a wide range of industries have led the tech world to embrace its promise beyond cryptocurrencies.

Our findings from this research are as follows:

- The blockchain is a digital database of transactions that is decentralized. Hosted by several computers connected in a peer-to-peer network.
- Blockchain technology is fundamental. It has the power to upend and change a variety of sectors.
- This technology is a type of distributed ledger technology that utilizes cryptographic and algorithmic methods to generate and validate a constantly expanding, encrypted data structure in the form of a chain of blocks that forms a single source of truth on the distributed ledger.
- Blockchain has number of use cases in different areas and industries including supply chain management, digital economy, intellectual property, crypto banking, and stock exchanges etc.
- Blockchain might bring about major change in the financial services sector by giving businesses a completely new way of operating.
- Considering the difficulties blockchain technology faces, its application is rapidly expanding in many prosperous countries.

Based on the findings of this study, we can propose the following recommendations:

- There is a necessity to implement laws governing the application of blockchain technology within the financial sector, as well as to establish a more competitive market characterized by adaptable regulations for the provision of such services.
- Reinforcing the blockchain technology structure to meet the actual issues that this system faces, both technological and practical;
- Creating oversight and control systems that adhere to the requirements of the digital economy will enable them to identify flaws and shortcomings and take the appropriate action.

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