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Blockchain the Revolutionary Technology

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Abstract: ***Blockchain technology has attracted tremendous attention in the capital market. The nature of Blockchain technology has lead businesses, industries, and entrepreneurs from all around the world to explore the technology's potential and had made revolutionary changes in different sectors. This paper traces the development of blockchain systems to reveal the importance of blockchain applications and the future development of blockchain application. This paper covers different application of blockchain. The readers will gain an overview of Application of blockchain and get familiar with recent developments in the blockchain application. The paper also finds that exploring the application of blockchain has only begun with some limited studies in areas such as the Cryptocurrency, Energy, Finance, Healthcare, and Government.***

1. Introduction to Blockchain

A Blockchain is a chain of blocks that contain Information and Data. Blockchain can be described as a data structure that holds transactional records and ensuring security, transparency, and decentralization. In Blockchain records are stored in the forms of blocks which are controlled by no single authority. A blockchain is completely open to everyone on the network. Blockchain have already been adopted in many applications of various domains. The first successful application of the Blockchain technology came into being in the year 2009 by Satoshi Nakamoto. He created the first digital cryptocurrency called Bitcoin using Blockchain Technology.

Blockchain is a peer-to-peer(p2p) distributed ledger technology and has three major components:

- **Distributed network:** The decentralized peer-to-peer architecture has nodes consisting of network participants, where each member stores an identical copy of the blockchain and is authorized to validate digital transactions for the network.
- **Shared ledger:** The user of the network records the ongoing digital transactions into a shared ledger. They run the algorithms and verify the proposed transaction, and once many users validate the transaction, it is added to the shared ledger.
- **Digital transaction:** Any digital asset that could be stored in a blockchain could qualify as a digital transaction. Each transaction is structured into a 'block,' and each block contains a cryptographic hash to add the transactions in a linear, chronological order.

In this paper, we survey blockchain application in different areas including cryptocurrency, healthcare, advertising, copyright protection, energy, and societal applications. And security of blockchain has been explained.

2. Blockchain Application

Smart Contracts

Smart contracts help you exchange shares, property, money, or anything of value in a conflict-free and transparent way while not having the services of a middleman. Your documents are encrypted on a shared ledger. There is no way that someone can lost the document. The encryption of websites keeps your documents safe. There is no hacking. Smart contracts save you money since they do not need the presence of an intermediary. Automated contracts are not only faster and cheaper but also avoid the errors that come from manually filling of forms.

This contract is embedded in blockchain making it immutable, transparent, and decentralized. Smart contract has its address in the blockchain. The contract can be interacted with by using its address presuming the contract has been broadcasted in the network. The smart contract cannot be lost since it is embedded in the blockchain.

Ethereum is the most leading smart contract framework, Ethereum was designed and created mainly to support smart contracts. It runs smart contracts without any possibility of downtime, fraud, or third-party interference. The Ethereum blockchain database stores transactions between people, transactions involving smart contracts, and their source code.
Smart contracts are gaining popularity and have already been implemented in various projects of blockchain

This is the Implementation of Smart Contracts in different Industries:

- Healthcare: Smart contracts can improve healthcare. They can streamline processes for insurancetrials, increase access to cross-institutional data, and boost confidence in patient privacy.
- Banking: Banking is the primary industry where smart contracts is the most significant alternative to the traditional mode of transaction.
- Legal Issues: The traditional model of resolving legal issues and certifying documents is also giving way to smart contracts. Smart contracts eliminate the need for notarization, offering not only an automated and unbiased but also a cost-efficient solution.
- Government Works: Many countries are working to offer a blockchain based voting that supports security, cost effective campaign. The primary goal is to enable transparency in voting and unbiased voting.

Benefits of Smart Contracts:
Cost efficiency: Eliminating intermediaries removes additional cost, allowing businesses and their customers to interact directly but also to do so with low fees for transactions.

Record Keeping: All the smart contracts transaction is stored in a chronological order in the blockchain and can be access at anytime and anywhere.

Resistance to failure: There is no need of third party, no single person can control the data on the blockchain. Even if an individual leaves the blockchain network, the network will continue to function with no loss of data.

Transparency: The conditions of the smart contracts are fully visible and accessible to all relevant parties. There is no way to dispute them once the smart contract is established.

Cryptocurrency
One of the most active areas of the blockchain is the cryptocurrency. A cryptocurrency is a virtual currency that is secured by cryptography, which makes it nearly impossible to double-spend it.Many cryptocurrencies are decentralized networks based on blockchain technology. The first blockchain based cryptocurrency was Bitcoin which is the most popular and most valuable cryptocurrency. Today there are thousands of alternate cryptocurrencies with have more improved specification. Some of these currencies are clones of bitcoin and there are cryptocurrencies which are built from scratch.

Double spending: In Cryptocurrency we can address the problem of double spending. When person registers transaction it is broadcasted to the entire network of a cryptocurrency and help to determine whether the transaction is authorized. If they collectively decide that the transaction is in order, then the transaction can be accepted and everyone on that cryptocurrency block will update their blockchain. This protocol can help prevent double spending.

Features of Cryptocurrency
Immutability: It will not allow you to re-write the history and it is impossible for anyone to move funds, only the owner of the private key can move the funds.

It keeps the track of all transactions and maintain the history and security in encrypted form.

In traditional currencies government and banks control the financial system. However, in the cryptocurrencies these transactions can be validated by a distributed and an open network. Most of the cryptocurrencies are decentralized on a distributed network of computers that is all around the world, it is also known as nodes. Transaction are verified by nodes through cryptography and records are kept on a public distributed ledger called a blockchain. The transaction is propagated across the peer to peer network and is replicated by every node of the network reaching a large number of nodes within a few seconds.

Cryptocurrency is not controlled by a central authority, so the user does not need to identify themselves while processing transaction with cryptocurrency. Bitcoin uses private key and public key system to authenticate the transaction process. The user can create an anonymous digital identities and digital wallets on the decentralized system to securely store their cryptocurrency.

As central bank can issue as much currencies as they want so the central bank manipulates the value of the country currencies as their economics policy. Countries mostly manipulate their country currency to be inflationary over a time. Due to inflationary nature of the country currencies the currency holders might have to bear the cost of the decrease in the value. And on the other hand, most of the cryptocurrencies have a pre-determined and a limited supply of the currency. For example, 21 million is the maximum supply of the bitcoin and once the limit is reached no new bitcoin can be mined. To prevent currency manipulation and decrease of value over time cryptocurrency intentionally creates scarcity.

Different types of cryptocurrency

Bitcoin: It is one of the most known cryptocurrencies, using blockchain technology we can make transparent peer to peer transaction. All other users can view the transaction but only the owner of that bitcoin can decrypt it with the private key which is given to each owner.

Litecoin: It was launched in 2011 as an alternative to the bitcoin. Litecoin is an open source, global payment network that is completely decentralized. Litecoin has a faster transaction time, it takes 2:30 minutes to process a transaction in the next Litecoin block. Litecoin has a supply limit of 84 million coins.

Bitcoin cash: It is a type of a digital currency which was created to improve features of bitcoin. In Bitcoin cash the size of the blocks were increased allowing transaction to be processed faster.

Ripple: It was released in 2012 and it acts as both as cryptocurrency and a digital payment network. It is a global network that is designed to create secure, fast, and cheap method of transferring money. Ripple can consistently handle 1500 transaction per second. Ripple is different from other cryptocurrency because its primary focus is moving sums of money on large scale.

Ethereum: It was created in 2015, Ethereum is an open source platform based on blockchain technology.While tracking ownership of digital currency transactions, Ethereum blockchain also focuses on running the programming code of any decentralized application, allowing it to be used by application developers to pay for transaction fees and services on the Ethereum network.

Healthcare: Healthcare is one of the fields where blockchain is considered to have great potential. To transform healthcare, the focus should be given to the management of data that could benefit from the potential to connect disparate systems and increase the accuracy of Electronic Health Records. Blockchain based healthcare systems could enhance reliability of patient's data since

patient's would have control over their healthcare records. These systems could help to centralize patient data which will enable the exchange of medical records across different healthcare institutions. Storing the medical data of patients is very important in healthcare. These data are very sensitive and therefore also can be a prime target for cyber-attacks. Another aspect is control over the data which would ideally be managed by the patient. Blockchain technology is very robust against attacks and failures and provides different methods of access control.

With Blockchain there will be no need of a central administrator and all the users will have the control of al their information and transaction. Since healthcare industry deals with confidential information of patient and it requires quick access to the patient information, blockchain can streamline these medical records and enable data sharing in a secure way.

Benefit of Blockchain in Healthcare:
Single patient record: Doctors can see a patient's full medical history, including inpatient or outpatient care or diagnostic test, all this can be stored on a blockchain which can be accessed any time.

Supply Chain management: Blockchain based contracts can assist healthcare organization in monitoring demand supply cycles through its entire lifecycle which includes how is transaction taking place, whether the contract is successful or is there any delay.

Interoperability: With blockchain network being shared with authorized providers in a standard and secure way that eliminate the cost and burden associated with data reconciliation. Other than this blockchain can provide drug supply management, clinical trials and prevent frauds.

Society Applications
Money lending that is through Smart contracts is the next generation of the network infrastructure expected to solve credit problems, can upend traditional borrowing relationships. In the traditional lending relationship, the lender not only lends money but also takes risks, which also leads to the high loan interest and the mortgage of goods in the traditional lending relationship, and the value of goods mortgage is often higher than the loan amount. Withthe smart contracts the borrowers can use the virtual assets as collateral, not only to prevent discounts on physical items, but will also reduce the credit cost. There is no need to show the lender credit or work history and numerous other documents. The property is encoded on the blockchain for all to use.

Electric Vehicles: There are still fundamental obstacles before the popularization of electric vehicles, including the scarce charging infrastructures and the complexity of deploying them. Blockchain technology makes it convenience for personal owners of these infrastructures to provide services. Also, it can simplify the process, thus cutting down the costs during the charging. Obviously, these advantages could draw us nearer to the future of wide applications of Electric vehicles. Besides that, it is possible for Electric vehicles to charge and discharge by analysing the needs of electricity and applying smart contracts and serve as batteries to stabilize the allocation of energy. For now, the main limitation within blockchain when applied on an electric vehicles business lies on the performance.

Blockchain government
Democrats and Republicans questioned the security of the voting system in the election. With the blockchain and smart contracts, everyone can see his vote and the overall statistical process. In addition to a significant proportion of the annual government budget is used to verify the flow of funds, and the use of blockchain technology can simplify the process. Blockchain can be managed by self providing a platform for the companies, individual citizens, foundations, andgovernment agencies. Individuals can ensure that their will is reflected through blockchain.

Smartphone: A car key with an anti-theft device can only be activated when you click on the correct protocol on the key. The smartphone will only work if you enter the correct password. They are all committed to the encryption technology to protect the ownership. The problem with the original form of intelligent property is that the key is kept in a physical container and cannot be easily copied or transferred. The blockchain solves this problem by allowing all blockchain miners to copy and replace the lost protocols.

Energy: The trading of commodities and energy, even the simplest of the transactions, is often a balanced game of multi-parties. From the execution to the conclusion of the transaction, both parties should coordinate and verify the transaction data. Additionally, through the transaction lifecycle, a company may need to interact with other counterparties, exchanges, brokers, logistics providers, banks, and price reporters. In addition, the verification process needs to be carefully coordinated not only between the two parties of the transaction, but also within the company to maintain manual processes between different departments to ensure that an accurate view of entire transaction process.

Energy Financing: Many of the enterprise plans have beenconsidered to apply blockchain technology, including utilizing cryptocurrencies to raise capital, mostly focused on the green energy field. Blockchain will make it easier to raise capital for the clean energy projects via connecting more potential investors to the company. Nonetheless, it is not obvious yet whether it is indispensable to build up a decentralized network for accelerating the process of raising funds.

Sustainability Attribution: One of the most intuitive applications of the blockchain in the energy industry is to continuously record energy production processes, including pollution emission data, andproportion of renewable energy. These truthful records help improve poor decision making.

Energy trading: Within this category, two groups have been emerged: some initiatives aim to use blockchain to fundamentally rearrange the existing energy system while others seek to incrementally improve it. For example, Peer-to-peer cryptocurrency exchange seem to be a naturally give the blockchain a non-central characteristic. In other areas,

including the energy sector, many researchers and developers take for granted the idea of decentralization. We are pessimistic about this because they are trying to subvert only centralized management rather than a more efficient way of managing complex systems. Another example is grid transactions. These projects include the restructuring ofthe existing power markets, through blockchain, where transactions will be verified faster and at a less cost than before. While reforming the traditional electricity market, the new distributed energy market will also be likely to develop and become a "power mining machine". Once the complex and large power market changes like this, it will greatly promote the development of power industry and improve productivity of the energy industry.

3. Conclusion

In this work we have survey the application of blockchain in different fields such as healthcare, smart contracts, cryptocurrency, energy, and society application. From this research it is clear that blockchain technology is not fully explore. Further research suggestions would include the economic implications and decentralized application of blockchain