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A Review of Blockchain Applications in Various Fields

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ABSTRACT

The BT has the potential to significantly alter every element of human life and may have a lasting impact over the next few decades. This technology has changed how we view corporate processes and has had a significant impact on our current economy. The peer-to-peer decentralized immutable public database technology known as BT was created by Satoshi Nakamoto in 2008 through the virtual currency or cryptocurrency known as Bitcoin. It has transformed management of different systems. Since the idea for BT was first conceptualized in 2008, enthusiasm has been increasing. Concern about BT stems from its decentralized and distributed qualities, which provide security, privacy, and data integrity without the need for an intermediary organization to oversee transactions. More people now use blockchain.

CCS Concepts

• Security and privacy Human and societal aspects of security and privacy Social aspects of security and privacy

Keywords

Blockchains; Cryptocurrency; Healthcare; Advertising; Energy.

1. INTRODUCTION

Today, blockchains are a hot topic in news outlets all over the world. They have already been deployed as decentralized methods for fraud-resistant computing without a reliable authority in several applications across many different disciplines. A distributed, append-only log of time-stamped entries that is cryptographically shielded against alteration and amendment is known as a blockchain [1].

The use of blockchain is surveyed in this article in a variety of industries, including cryptocurrency, healthcare, advertising, copyright protection, energy, and societal applications. Following the discussion of a few instances, more are provided in the section that follows. Numerous additional cryptocurrencies, such as Litecoin, Name coin,

Swift Coin, and Bytecoin, have appeared since the first blockchain-based cryptocurrency with the name bitcoin was established in 2008 [1] [2]. Fragmented medical records are brought together via blockchains.

integrated to track individual medical histories [3]. Blockchain technology is used by Meta X [4] to combat fraud in online advertising. A blockchain-based insurance marketplace called Insure [5] was created to increase the efficiency of the insurance sector.

Our article offers a contemporary summary for anyone who are interested in blockchains, both personally and professionally. Additionally, our work will inspire additional blockchain applications. Prior survey studies on blockchains, in contrast to our work exploring applications in many fields, have either focused on technical problems like security [6] and consensus methods [7] or on specialized applications like the Internet of Things [8] and finance [9].

The remainder of the essay is structured as follows. We describe many blockchain applications in Section 2 of this article. Related work is included in Section 3. Section 4 serves as the paper's conclusion.

BLOCKCHAIN APPLICATIONS

1.1 Cryptocurrency

Especially in the realm of cryptocurrencies, the financial industry is one of the most active uses of the blockchain. Numerous cryptocurrencies have appeared since the first carrier bitcoin entered the blockchain [1]. Because of characteristics like anonymity, verifiability, decentralization, and consensus procedures, the price of one bitcoin has already risen to an astounding \$6,300 [9]. The present thriving cryptocurrency industry is made up of a number of other cryptocurrencies that have arisen at the same time and have better functionality. Among these, Ethereum [10] developed a public blockchain platform that allowed the deployment of smart contracts in 2015. Contracts have made it possible to use blockchain technology in a larger variety of commercial contexts, such as contract processing, ownership transfers, the Internet of Things, and the financial industry

borrower's account, and continues to track all transactions. The trend toward electronic finance makes it natural for the blockchain and makes repurchase an automated clearing house. Many banks have also begun to invest in blockchains in recent years. Fedor Bank [15] is an online bank in Germany and the first mainstream bank to experiment with virtual currency and blockchains. In cooperation with a bitcoin exchange Kraken headquartered in San Francisco, the exchange of euros and bitcoins was launched in October 2013. Fedor Bank works with Ripple Labs to provide low-rate transfer services using the payment technology of the other party. In February 2015, the bank partnered with bitcoin.de to launch the P2P Bitcoin Transfer Service. Citibank has built three independent systems based on blockchain distributed technology internally. The blockchain technology is also one of the five key areas of focus that Citigroup released in July 2015. Although the decentralized trust mechanism of blockchain technology can better solve the problem of value exchange on a global scale. However, from the current actual operation, there are still limitations in the following aspects. The first is the security of the blockchain. The blockchain is different from traditional financial facilities. Traditional financial facilities are controlled by an organization, and related software and hardware facilities are not publicly available. But the blockchain is an open application, and the code for the blockchain system is shared among the participants. As a result, blockchain-based applications are more vulnerable to attack than traditional financial facilities. The second is the privacy protection of the blockchain. In the traditional financial business model, data is stored on the central server, and the system operator protects data privacy. In blockchain-based applications, data is publicly transparent and each participant is able to get a complete data backup. Despite the existence of "pseudo-anonymous" in blockchains, for financial institutions, in some financial business scenarios that must be kept secret, this model is too simple to accommodate the needs of complex financial services.

1.1 Healthcare

The pace of progress is accelerating at ever-increasing rates in the area of healthcare. Today, there is a demand for high-quality medical facilities that are backed by cutting-edge and modern technology. Here, Blockchain would be important in revolutionizing the healthcare industry. Additionally, the structure of the healthcare system is changing in favor of a patient-centered strategy that emphasizes two key components: always having access to the right resources for treatment. Healthcare firms may better deliver proper patient care and top-notch medical facilities thanks to the blockchain. Using this technology, the time-consuming, repeated process of health information exchange, which contributes to high healthcare expenses, may be resolved swiftly. Citizens can participate in health research programmes using Blockchain technology. Better research and data sharing on the public

Advertising

The digital advertising supply chain makes sense for the blockchain since it is a distributed, transparent, immutable record. Ineffectiveness, inefficiency, and lack of transparency in advertisements have solving for which digital advertising has always had fundamental problems. Blockchains enable us to greatly increase efficiency and transparency, lower costs, and stop fraud [18]. Globally, digital advertisers spent \$209 billion [19] on the medium in 2017. Over the last two years, a lot of businesses have been working hard to develop blockchain-based advertising systems thanks to a significant inflow of venture money [20]. Blockchain technology is being used by the blockchain business Metaxa [4] to address concerns with fraud and transparency that affect digital advertising. The public can test several applications that have been developed. One of these software programs, known as Ads.txt Plus, is an open-source tool created to weed out dishonest vendors and resellers along the programmatic supply chain. a division of Permian.

1.2 Insurance

Traditional insurance contracts are usually written on paper, which makes them prone to error and frequently necessitates human monitoring for claims and payments. The inherent complexity of traditional insurance, which incorporates risk in addition to clients, brokers, insurers, and reinsurers, makes this situation worse. It improves the productivity of the insurance industry in four areas, including reinsurance, data analysis via the Internet of Things (IoT), fraud detection, and claims automation [21]. The insurance industry that sells risk will experience a significant revolution thanks to the inherent scalability of blockchain, the assistance of IoT, and the flow of all data, including personal historical credit information, accident environmental information, historical policy information, and more. A few pioneers have started taking part in this. They'll deliver.

1.1 Copyright protection

A legal structure known as copyright protection gives exclusive rights to the authors of original works and forbids others from using, duplicating, or disseminating those works without their consent. All kinds of creative expression, including literature, music, art, software, movies, and more, are subject to copyright laws.

Blockchain is a distributed, decentralized mechanism for maintaining digital records [26]. Given that a file is duplicated hundreds of times throughout the network, this network is designed to frequently update and reconcile all the copies in order to guarantee the accuracy of all records. A single machine or entity does not have control over the blockchain. Given that there is no one repository, it is almost impossible to alter or corrupt. After the initial record, any changes to the ledger are irrevocable. As a result, if a copyrighted work is utilized illegally, a digital ledger with the owner's information and the whole history of transactions is actually public and easy to authenticate.

When it comes to copyright protection, blockchain does have certain limitations. One of the questions is about first upload authentication. To put it another way, how can ownership be determined when a user uploads an image? Other limits, such as how to manage the use of licenses by anonymous and untraceable consumers, are still problematic.

Energy

By enabling decentralized, transparent, and effective energy transactions, energy blockchain applications use the fundamentals of blockchain technology to revolutionize the energy sector. Examples of energy blockchain applications include the following:

Peer-to-Peer Energy Trading: Blockchain can make peer-to-peer energy trading possible, enabling people or companies to buy and sell surplus energy without the use of middlemen. Blockchain-based smart contracts automate the settlement process to ensure

safe and open transactions.

Renewable Energy Certificates (RECs): Renewable energy generation and consumption may be tracked and certified using blockchain. The environmental characteristics of renewable energy sources are represented by RECs, which may be exchanged on blockchain platforms. This guarantees the veracity of renewable energy claims and offers transparency.

Energy Financing: Numerous business concepts have sought to use blockchain technology, often focusing on the green energy sector and using cryptocurrencies to acquire finance. Because blockchain will link more potential investors, it will be simpler to raise money for renewable energy initiatives. However, it is not yet clear whether creating a decentralized network is indeed necessary to speed up the fundraising process.

Sustainability Attribution: The ability to continually record energy production processes, including the percentage of renewable energy and data on pollutant emission, is one of the most straightforward blockchain uses in the energy sector. These trustworthy records aid in reducing fraud and bad judgement.

Electric Vehicles: Even up to now, there are still fundamental obstacles before the popularization of electric vehicles (EVs), including the scarce charging infrastructures and the complexity of deploying them. Blockchain technology makes it convenient for personal owners of these inf

Services are provided by restructures. Additionally, it helps streamline the procedure, lowering the charge expenses. Clearly, these benefits might bring us closer to a day when EVs are widely used. In addition, EVs may be used as batteries to stabilize the distribution of energy and charge and discharge by analyzing electricity demands and implementing smart contracts.

Performance is now blockchain's biggest barrier to adoption in the energy sector [30]. Applications using blockchain technology, like Bitcoin [1], can only process three transactions per second, with a maximum of seven. Critical mass is an additional restriction. Industry consensus on common standards is required before blockchain may be used as a common industrial infrastructure. Given the number of parties involved, it will be extremely difficult to reach an agreement.

1.2 Society Applications

Lending unconventionally: Smart contracts, the next-generation network architecture that is supposed to address credit issues, have the power to dismantle conventional borrowing arrangements. In a typical lending arrangement, the lender not only lends money but also assumes risk, which also results in high loan interest and the mortgage of commodities, the value of which is frequently greater than the loan amount. Borrowers can utilize virtual assets as collateral using smart contracts to avoid discounts on tangible goods as well as to lower the cost of lending. No need to provide the lender with extensive documentation, an employment history, or your credit history. For everyone to utilize, the property is encoded in the blockchain.

Car / smartphone: For instance, you can only activate a vehicle key with an anti-theft device when you click on the right protocol on the key. You must enter the right password in order for the smartphone to function. To preserve ownership, they are all committed to using encryption technology. The drawback of the original version of intellectual property is that it cannot be readily reproduced or transferred since the key is retained in a physical container. By enabling blockchain miners to replace and duplicate deleted protocols, the blockchain ledger finds a solution to this issue.

Blockchain music: Music publishers have struggled with copyright concerns throughout the record and digital music eras. By using a blockchain and smart contract to build a traceable music copyright database, this issue may be resolved. Additionally, you may even transfer money in real time as consumer behavior changes to both the copyright holder and the performer. Music lovers can make payments with digital money.

Blockchain government: In the 2016 U.S. election, both Democrats and Republicans raised concerns about the security of the voting process. With the blockchain and smart contracts, each person can view their vote as well as the entire statistical process. Additionally, a large percentage of the yearly government budget is allocated to verifying the flow of cash, and blockchain technology has the potential to significantly streamline this process. By giving organizations, foundations, governmental bodies, and private people access to a platform, blockchain may be self-managed. Blockchain enables people to guarantee that their wishes are carried out.

RELATED WORK

Prior survey studies on blockchains have either addressed technical problems like security [6] and consensus methods [7] or specialized applications like the Internet of Things [8] and banking [9], in contrast to our work that discusses applications in several fields.

Blockchains have also been employed in the food supply chain [36], real estate business [33], transportation [34], charity [35], and education [32], in addition to the uses listed in this study. The inclusion of these applications in a more thorough study is a potential future step.

4. CONCLUSION

Globally, there is a lot of interest in blockchain technology. In this research, we look at how blockchain technology is being used in a range of fields, including cryptocurrencies, healthcare, advertising, insurance, copyright protection, energy, and societal applications. For businesses interested in blockchains, this paper provides a current overview. The discussion will also suggest new applications for blockchain in other industries.

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