Blockchain—Technology to Drive the Future

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Abstract Blockchain technology first came into public discourse through the rapid growth of Bitcoin currency. The financial services was first to realize its importance, but in recent years, we have started seeing the application of Blockchain technology in different streams—manufacturing, healthcare, e-voting, financial services and legal contracts. Through this paper, we will try to cover the current usage of blockchain technology in different areas, the potential of this technology in newer areas and see how it is changing the fundamental ways of transactions in a lot of different business areas.

1 Introduction

Blockchain technology uses a distributed ledger model that facilitates authentication of transactions in a fast, cheap and secure manner. The building block of this technology is a block of records, which are distributed between different members of the network, which are publicly available, synchronized and uneditable. This is called open ledger chain as all the participants in the network know the transactions of each participant, i.e., transactions are transparent and open.

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1.1 Blockchain

The growing importance of blockchain technology can be gauged by the fact that reputed organizations like World Economic Forum, which in a recent report projects that 10% of world economic output will be stored on blockchains or blockchain-related technology. Its primary application is in the field of financial services, primarily cross-border trade and payments as it enables transactions between entities in a faster and cheaper way. Blockchain already is finding a lot of application in areas of banking, media, e-governance and other fields which require a third party central repository of data to authenticate transactions. To understand the implication of blockchain technology, we have to go to its basic building blocks —the users have access to a distributed database, a user on the network can edit only the part it owns using keys to write its file and the files of every user on this database are always kept updated, whenever anyone user makes changes in its file, this change is updated across the database.

The current systems of doing transactions require a neutral third party—either regulatory or participatory, which validates the transaction between two parties. So for instance, we use digital signatures for signing contracts or we have banks governed by a central regulatory body which facilitates transfer of funds between two entities across borders. The blockchain is of great use in these test cases as its distributed verifiable database helps reduce costs (banks charge a huge fee for cross-border transfers), it is faster (turnaround time is much faster) and the system is a lot more secure (it is not easily hack able).

1.2 How a Blockchain Works?

Suppose user A wants to send data to user B using a network, every transaction from A to B is done through the network and this transaction is represented as a "block". This block is broadcasted to every node in the network and these nodes are able to verify the data in the block. The block which is verified, is added to the chain, and this is now available for use by all users. This block cannot be edited, but can be only seen by all users. This completes the data transaction between A and B (Fig. 1).
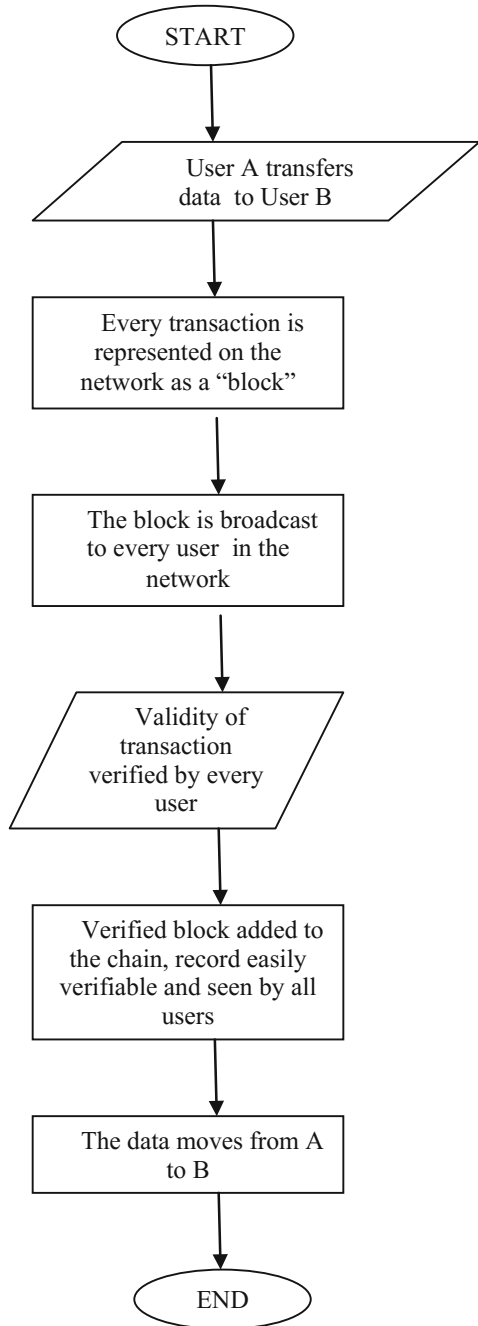
Fig. 1 Flowchart for how a
blockchain works

START

User A transfers
data to User B

Every transaction is
represented on the
network as a "block"

The block is broadcast
to every user in the
network

Validity of
transaction
verified by every
user

Verified block added to
the chain, record easily
verifiable and seen by all
users

The data moves from A
to B

END

Table 1 Comparison between blockchain and traditional database [10]

Attribute	Blockchain	Traditional Database
Data ownership and privacy	Encryption and decryption algorithms	Centrally monitored in form of rows and columns
Access	Same for all verified nodes	Decided by central monitor
Data validity	Transparent, visible through verifiable public data	One query at a time can be dealt with
Transaction	Known to all the nodes	Central monitor only manages all the transactions
Security	More secure as one can keep checking previous blocks	Not very secure

2 Comparison with Traditional Database

(See Table 1 [5]).

3 Usage Cases

Currently, there are a lot of gray areas and it is difficult to arrive at a common language, especially when we talk about rules covering banks, legal affairs, and government and there is a lot of different interpretation among these different departments. In these uses, we can use blockchain technology, such that these different bodies are aware of the change in rules through a verifiable database and it would really enhance the productivity, reduce conflicts across different departments and find applications in areas like land records, social welfare projects, insurance databases and the ever changing landscape in KYC norms enforced in financial markets.

3.1 Trade Payments

Financial sector companies [1] after a lot of initial reluctance have started embracing the technology. While earlier they looked at this technology at a disruptor and opposed it, they have realized that this technology can help them deliver better solutions, which helps them have better relationships with their clients and grow their business. It can play the role of a facilitator by reducing the execution timeframe of transactions, while enhancing the transparency and security of these transactions. The test cases are in the domain of international trade finance [2], subsidiary payments and digital payment cross-border platforms.

3.2 Insurance

In the insurance industry, there is a lot of focus on identifying the right underlying asset, which can be easily identified as well as not easily copied. This problem can be resolved using a blockchain which can keep the record of an asset, the history as well as record the changes, every time the ownership of the asset changes. This can then used by general insurance industry in diverse areas for keeping as well as verifying records, property, cars, laptops, and other physical assets.

3.3 Credit Cards

We see different uses in different verticals across the banking channel. Currently, suppose we use three different cards for spending, we realize that the reward points we obtain on different cards individually do not add up to a significant value and so many times, these points lapse, as we do not find any purchase to justify spending those reward points. In China, China Union Pay and IBM [3] has completed a pilot project wherein the customers using cards from different banks can exchange these bonus points across different banks and make good use of them.

3.4 Real Estate

In the real estate transactions, we always need a central authority, which certifies the authenticity of the land records, before two parties actually can execute a transaction. A blockchain can resolve that problem, as here the records can be stored, wherein the document is secure, authentic and is easily verifiable by a neutral third party. Already we see law firms using this technology to overcome the cumbersome and tedious process of certifying records.

3.5 Travel Industry

It is a very nightmarish experience for a lot of us, when we book our holidays and then find that the hotel room we get, is not the one we paid for. An Australian company Webjet [3] is trying to solve this problem with the help of Microsoft. They are using blockchain for its application in its interaction with travel agents, which supply hotel rooms, so as to ensure that the errors in this sector are taken care of. This would ensure that they have the right idea about the inventory available and hence make optimal decisions in hotel booking.

3.6 Contracts

Another potential area of blockchain usage which excites a lot of players is its ability to enforce contracts, with potential contracts and agreements replaced by blockchain applications. We already have the usage of smart contracts—these are contracts where rules are enforced by computer programs. Blockchain makes it easy to register, verify and implement smart contracts. A test case for smart contracts can be banks, which use escrow accounts to pull in and pay according to certain conditions, blockchain can ensure simpler execution of these escrow accounts.

3.7 Electronic Voting

This technology can be used for a robust electronic voting system. Participants in an election can register online and receive a unique electronic vote. Now these individual votes can be recorded in a blockchain and every voter can check whether his vote was marked correctly, and hence it is a quick and secure verification by the entire group of voters on individual votes. This could take more heat from the criticism we hear these days about electoral [4] and make it more transparent. Every voter would be able to verify his own individual vote. NASDAQ is already using it on trial basis for vote on its shareholder meetings.

3.8 Electrical Distribution

There have been instances of huge transmission losses in electrical distribution system and it is a critical area, as we have a scenario of ever increasing demand and limited sources of energy. One project involves the creation of a smart local power grid-based on distributed blockchain technology. This has tremendous potential in inaccessible remote areas, such systems would allow the distribution, metering and billing of electricity to be administered within the community itself, rather than being reliant on external multinational power and finance institutions.

3.9 Intellectual Property Rights

As we move toward a future digital age and rapid dissemination of information on the Internet, there is a lot of concern on the gray areas around intellectual property rights and how do we protect IPR in this age. Blockchains can be used to create a permanent or transferable link between the owner and a piece of IP, to handle licensing and distribution issues of individual IP items.

3.10 Health Records

A very high impact application of blockchain technology is in the space of health records. The security, verifiability and low costs associated with a blockchain make it a suitable candidate for sharing medical records. Estonia is among the few if not the only digital societies which have 100% of their medical health records online. This technology will be a great enabler for health, as it provides access to patient records and helps them with both clinical and financial assistance (lowering the overall costs). It reduces the intermediary costs by a significant margin.

3.11 Media Companies

Media companies have also started looking at blockchain technology to optimize their assets and have identified the following areas for usage of blockchain technology. Some areas identified are as follows—instant payments for streaming live video, rent excess space from their storage for commercial purposes, digital identity to replace username password and smart contracts for enforcing digital contracts.

3.12 Manufacturing

Manufacturing smart equipment can replace human contracting parties [5] for certain transactions. Devices on the Internet of Things can communicate with smart contracts to keep track of the status and state of smart contracts [6] for settlements. Smart shipping containers could, for example, automatically sell their surplus capacity. It facilitates faster settlements using cryptocurrencies.

3.13 Verification

The problem of fakes is as old as the human civilization. Even now as we move to digital age from the physical age, we have to tackle this problem in a bigger way. The trust of an online marketplace depends on its suppliers providing the right product to its customers [7]. Blockchain technology can help in this chain involving product companies, suppliers and marketplace, by providing all the players in the chain, individual points, which can verify the genuineness of the product.

In India, RBI has set up a committee to study use of blockchain technology to reduce use of paper currency [8]. ICICI Bank has used blockchain to do a cross-border trade transaction and seen its use in reducing time for executing the transaction.

4   Challenges

As blockchain gets more users, some security issues have also cropped up. Though centrally blockchain has a robust secure system, there are challenges at an individual node. If a participant key is stolen, then the blockchain security can be compromised at that node. The adoption is still in pilot stage, unless we see more widespread usage, it will not make a significant difference to the ecosystem. The transparency that is essential to the blockchain, combined with the ability to trace participants' real identities, can lead to serious privacy issues. We still have to see how regulators react to it, they were very skeptical toward the Bitcoin usage.

5   Conclusion and Future Potential

The current stage of blockchain technology is exciting and its use is been explored in a lot of areas. It has seen a lot of adoption in financial systems, but its real test will come, when it is used in commercial applications and by government is executing large-scale projects (Fig. 2).

The enormous interest can be seen that existing large corporations are experimenting on the technology through pilot projects, while a few new companies are entirely working on one or more applications of the blockchain technologies. We believe the large-scale use of blockchain is still a few years away and we will see innovation on the way.
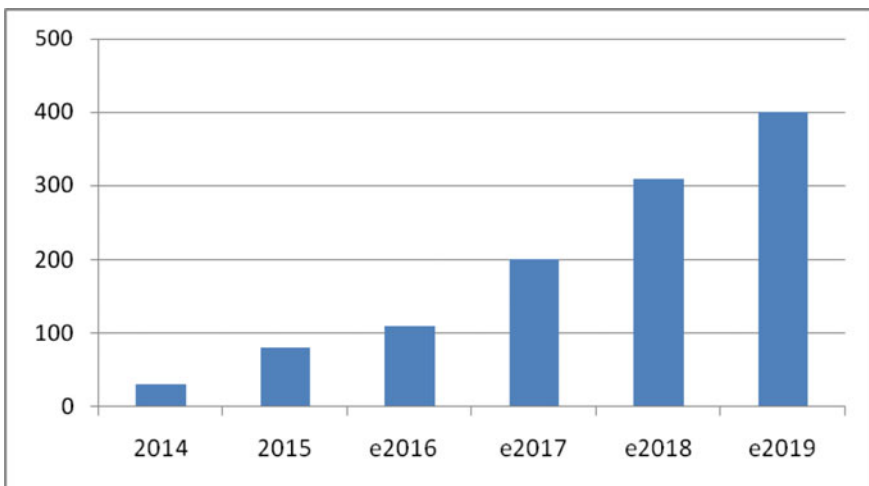

Fig. 2 Graph demonstrating spending on blockchain technology (USD Million) year wise [9]

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