

BLOCKCHAIN TECHNOLOGY & ITS APPLICATIONS IN FINANCIAL SECTOR

Nikhil Maloo

[Nikhil Maloo, who just recently graduated from IIT Kharagpur, has written this article for the Fintech Services division of Vinod Kothari Consultants P Ltd. Any comments or feedback on the article may be communicated to finserv@vinodkothari.com]

It is commonplace to hear: “Blockchain is the next big thing”. Whenever anyone hears the term “blockchain”, one visualizes it to be like blocks connected to each other through some sort of a chain. This is true in its most basic sense but not in actual or technical sense. The term “blockchain” consists of two words – “block” and “chain”. Block is nothing but digital information stored in an open database through cryptographic code (“chain”).

This article intends to discuss about the block chain technology along with its relevance in the financial sector.

BACKGROUND

The concept of cryptographically secured blocks connected through chains was developed back in 1991 but the first blockchain was hypothesized in 2008 when Satoshi Nakamoto (identity still not known) released the concept of bitcoin¹ which was described as “purely peer-to-peer version of electronic cash”. Over the last few years it has developed into one of the biggest revolutionizing technologies in today’s time with potential to impact every industry. It has drawn attention from both the public and the private sector regarding the use of blockchain technology to conduct businesses.

INTRODUCTION TO BLOCKCHAIN

In simple language, a blockchain is a **digital concept to store data**. Data is stored in the blocks and these blocks (containing digital data) are chained together through unique cryptographic codes called **hash** i.e., each block has its own block identification code and also contains code of the previous block which makes the data **immutable** and once the block is chained to other blocks it is nearly impossible to alter them. This rule out the possibility of tampering with original records which makes this concept so revolutionary. Blockchain can also be described as a **decentralised technology** or **distributed ledger** on which transactions are anonymously recorded and the same transaction record or ledger exists across a network of unconnected computers or server called **nodes**.

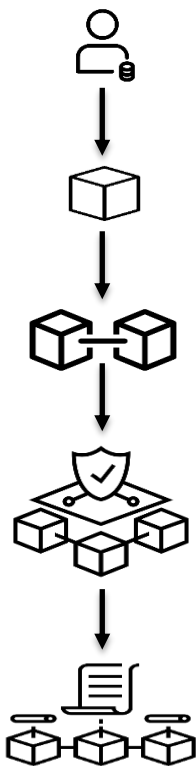
¹<http://vinodkothari.com/wp-content/uploads/2017/08/Bitcoins-India-Report.pdf>



Blockchain can be thought of as “**distributed spreadsheets**” where all participants in the particular blockchain have access to this spreadsheet and the data contained in it. A block can be thought of as a row containing four piece of information - transaction data, timestamp and a cryptographic hash of its own and of the previous row. As rows are connected to each other, blocks are also connected to each other through chains which are nothing but the hash of previous blocks. Thus, blockchain is a chronological order of records which cannot be tampered with once created.

HOW DOES A BLOCKCHAIN WORK?

A blockchain can be thought of as a chain of chronological blocks. A block is an accumulated set of data and has unique cryptographic hash and timestamp which forms its identity. All the blocks have the hash of the previous block which leads to the formation of a chronologically ordered chain of blocks right from the first block to the newly formed block. This process is done continuously to grow and preserve the network. Following is the step-by-step overview of how blockchain works:



1. **Transaction Data** - A user requests for a transaction.

2. **Creation of blocks** - A block representing the transaction is created. This block contains transaction data, timestamp and a cryptographic hash of this block and previous block. These hashes are created through hash algorithms (for example, bitcoin uses hashing algorithm known as SHA-256). A cryptographic hash function always gives the same output for the same input.

3. **Chaining the blocks** - Blocks are chained through hash. Each block comprises of hash of previous block and thus all the blocks are connected in a chronological order.

4. **Broadcasting** - Once a block is created through ‘mining’, the miner broadcasts the block to all the nodes of the network.

5. **Validation** - All the nodes validate the block and the transaction and add that block in their copy of network. This process of broadcasting and validation is called **proof of work**. The transaction gets verified and executed.

CHARACTERISTICS OF A BLOCKCHAIN

Knowing briefly about how blockchain works from a technical point of view, it is important to understand the characteristics of blockchain in order to appreciate the potential uses of blockchain technology.

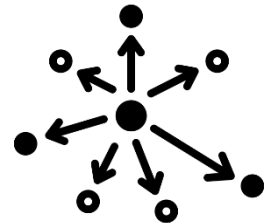
- **Agreement**

Blockchain consensus is the ability of all anonymous network participants or nodes to make decision, following network's rules and reaching to an agreement. Consensus can be achieved through many ways and one of the examples is proof of work.



- **Decentralised Network**

The fact that blockchain network is so resilient is largely credited to its distributed architecture. It is basically like a peer-to-peer network where files are shared, commonly known as torrenting. In case of client server model, downloading is slow and depends totally on health of the server. In a decentralized network, information is not stored in one single unit but in multiple units. Everyone in the network has access to full data and this nonexistence of single authority makes the system transparent and considerably more secure. Instead of relying on a central authority for secure transaction, blockchain employs advanced consensus protocols² across a network of nodes, to authenticate transactions and record data in an incorruptible manner. The decentralized nature of peer-to-peer system might completely revolutionize finance industry by eliminating intermediaries (banks) and introducing cryptocurrencies for transactions.



- **Immutability**

Data stored in a blockchain network cannot be modified by any participant since it uses cryptographic hash function, which would modify even if a minute alteration is made in the block data. If an error is made then it cannot be edited or undone. This makes it so secure and tamperproof. This feature might have huge implications for financial institutes since fraudsters cannot “work the books” in this case.



²<https://blockgeeks.com/guides/blockchain-consensus/>

- **Transparency**

This is one of the most interesting features of the blockchain network as blockchain gives transparency as well as privacy at the same time. A person's identity is hidden via complex cryptography and represented only by their public address. So, while a person's real identity is secure, transactions done by the person is publicly available to everyone on the network. In financial system, it adds the extra bit of level of accountability which will make the system very transparent.



APPLICATIONS OF BLOCKCHAIN IN FINANCIAL SECTOR

Blockchain's initial purpose was to serve as the mechanism behind cryptocurrencies, but today its utility is being recognized in almost every industry, from banking to government sector. Its impact on the financial sector can be huge and has the potential to revolutionize banking mechanism. Some of its possible implications are:

- **Faster & cheaper financial transactions**

Most of the third-party financial transactions consume a lot of time as these transactions take place via payment gateways (banks). The long-time required results in high monetary cost, especially in case of **cross-border payments** where transaction costs are very high. By introducing blockchain technology in the banking sector the transactions would become fast-paced (few seconds as compared to few days taken currently) and would eliminate third-party payment gateways, leading to **low financial transaction cost**. This will abolish third party charges from all financial transactions and will be beneficial to both individuals and businesses which perform a lot of financial transactions on a daily basis.

- **Trade finance**

Blockchain can also play an important role in the trade finance sector. Through blockchain-based trade finance, time-consuming paperwork and bureaucracy can be eliminated which would restructure the entire trading processes. Blockchain eliminates the need to individually maintain a database for all transaction-related documents as all necessary data can be integrated in one digital document, of which all the members have access to and is updated in real time. Blockchain even has the capability to generate new revenue streams. It has the capability of creating **liquidity out of complex assets** like real estate by creating a globally liquid secondary market for real estate. Properties could become tradeable entities and this would bring much required liquidity in this market.

- **Protection of intellectual property records**

The current system of recording property rights involves a government employee who manually enters the details in the physical deed into the country's central database. In case of a property dispute, one has to reconcile with the public database for claim to the property. This process is not only time consuming and costly but is also prone to human error. By using the blockchain technology this whole process can be simplified by storing and verifying property ownership data in form of blocks. The deeds stored in block would have their timestamp and cannot be tampered. Thus, owners can believe that their deeds are accurate and safe.

- **Smart Contracts**

By definition, smart contracts are a computer codes that are capable of executing the terms of an agreement (i.e. contract) using blockchain technology. It is an automated process and can aid legal contracts, as the terms of the smart contract are recorded in form of a computer language as a set of commands which is sent out to other computers via blockchain. By using smart contracts, the fees for a notary or third-party mediator or public judicial system can be eliminated. The biggest use of smart contracts can be in insurance business. Smart contracts can lead to the management of claims in a highly transparent and responsive way. For example, in houses equipped with Internet of Things (IoT) devices having insurance based on smart contracts would have no issues in claiming in case of natural calamity like fire since all the data from IoT devices is recorded on the blockchain and can be automatically analyzed by the insurer and processed. Smart contracts can accurately calculate damage costs and assess claims and can make automatic payments.

- **Reduction of fraud**

Since the traditional banking systems and organisations have a centralized database of all records, they are very much prone to hacking. Blockchain can help in reducing fraud as it is a decentralized system, where each transaction block has its own timestamp. More so, it is a technology that links each and every blocks of transactions chronologically. Hence it provides opportunities that can help reduce fraud in the banking industry.

- **Clearing and Settlement**

A lot of third parties, like brokers and the stock exchange, have always been involved in buying and selling stock. Most clearing and settlement procedures are centralized and this process can take long time. However, decentralized nature of blockchain technology can eliminate the unnecessary mediators and enable trading to run on a peer-to-peer network with all the final transactions been recorded in the blockchain.

- **Know your customer (KYC)**

All over the world, banks spend huge amount of money and time for know your customer campaigns in order to comply with AML (Anti-money laundering) and KYC norms. Through blockchain system, there can be a central database where the data of independent verification of a client collected by one bank could be made accessible for other banks to use so that they don't need to do complete the KYC process again since the KYC data is cryptographically stored in blockchain.

- **Accounting, Bookkeeping and Audit**

Due to strict regulatory requirements a lot of paperwork is involved in accounting. It can be transformed through blockchain technology which will simplify compliance and restructuring the traditional double-entry bookkeeping. Companies can write their transactions directly into a distributed spreadsheet, with the entries shared and cryptographically protected. This would make the records more transparent, and any attempts of fabricating would be almost impossible.

CONCLUSION

Ian Khan, TEDx Speaker once said "As revolutionary as it sounds, Blockchain truly is a mechanism to bring everyone to the highest degree of accountability. No more lost transactions, human or machine errors, or even an exchange that was not done with the agreement of the parties involved. Above anything else, the most critical area where Blockchain helps is to guarantee the validity of a transaction by recording it not only on a main register but a connected distributed system of registers, all of which are connected through a secure validation mechanism." This will have a huge impact on the working of financial sector which is why blockchain technology is also termed as *web 3.0*.