

Blockchain Revolution: The technology changing money, business, and the world!



The internet has already revolutionised the way we perform various economic and non-economic activities in different walks of our life and now the revolutionary Blockchain technology is all set to bring about a radical change in the domain of trade, commerce, communication, governance, entertainment, etc by facilitating distributed digitisation of events. It has also been claimed as a rather transparent and secure system in comparison to the centralised third party trust based system. In a narrow sense, it is often considered as the technology associated with bitcoins, however, in a broader sense; the concept goes well beyond bitcoins or crypto currencies. Though the emergence of crypto currencies has already gained a lot of attention around the globe, it is only recently that the underlying technology used by these crypto currencies i.e. Satoshi's peer-to-peer Blockchain concept has begun garnering interest for its potential application in vivid facets. The article attempts to explore the Blockchain technology and its mechanism along with financial and non-financial applications of this technology, particularly in case of India. Read on to know more...



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Introduction

Blockchain succeeded in attracting the attention of industry, regulators, governments and researchers due to its potential application in addressing a range of issues in financial as well as non-financial sectors. It is a disruptive technology that could open the door for developing an open and democratic digital economy and could be applied to a wide range of activities for creating a gamut of opportunities revolutionising not only digital world

Blockchain is essentially a distributed database that contains a chronological record of all the transactions or digital events happened among the participating parties. All transactions in the network are represented in terms of block and broadcasted to the participants in the network, verified, time stamped and linked with the prior blocks in the network to form a sequence of blocks known as Blockchain.

but also physical world. Where on one hand Johann Palychata, BNP Paribas proposed to consider this disruptive technology as a crucial invention like the steam or combustion engine, Marc Andreessen, the co-creator of Netscape, on the other hand has applauded it as something that the Internet always needed.

Sebastian Vos, Co-Chair of Covington's Global Public Policy and Government Affairs Practice has claimed that Blockchain has the potential to be the next great technological innovation, revolutionising areas from cross-border payments, trade finance and land registries to government records. Government and regulators of some of the countries are implementing Blockchain to revolutionise the operating and information storage mechanism in the domains of social records (birth, death and marriage certificates), health records, property ownership and transfer deeds, settlement of banking transactions, pre and post trading in stock market, electronic voting system, provenance of food, etc. Also, some of the innovative Blockchain based financial and non-financial platforms/applications have been developed by the budding startups and established players. Some examples of these include: Eris, Chain, Ethereum, Coloured coins, Azure and Hitfin, etc. Thus, possibilities of using this concept in financial and non-financial sector are limitless.

Concept of Blockchain

Blockchain is essentially a distributed database that contains a chronological record of all the transactions or digital events that happened among the participating parties. All transactions in the network are represented in terms of block and broadcasted to the participants in the network, verified, time stamped and linked with the prior blocks in the network to form a sequence of blocks known as Blockchain.

The financial crisis of 2008 was a major setback that led to a loss to the trust-based intermediation in financial ecosystem. Apparently, at that time Satoshi Nakamoto observed that electronic payments rely heavily on trusted third parties to process payments and have certain inherent weaknesses. Therefore, he identified the need of an electronic payment system that allows the parties to transact directly with each other without the need of a trusted third party system and thus, proposed the payment mechanism which is popularly referred as bitcoin. This bitcoin payment system is based on underlying Blockchain concept which uses distributed peer-to-peer network to broadcast all transactions, hashing and timestamping to create blocks and proof of work to verify these transactions and record them in public ledgers. Recording of transactions in public ledger makes the transactions verifiable across the network and makes it difficult to tamper with the transactions or records.

This concept thus has trio objectives namely, resolving the problem of double-spending, making it computationally difficult for an attacker to alter the block controlled by a majority of honest nodes and overcoming the innate limitations of trusted third party payment system. Consequently in 2009, this block chain based peer-to-peer software was made open source after which the value of bitcoins has risen steadily. Since then the Blockchain technology has further been advanced by other researchers and programmers who have added new features, enhanced the sophistication and discovered probable use cases of this technology. Two significant advancements in this technology have been altchain and sidechains.

The three main components of this technology are infrastructure i.e. distributed database and peer-to-peer network; parties involved i.e. sender, miner and receiver and underlying mechanism i.e. use of cryptography, timestamping and proof of work. Together these three components form a robust system that facilitates transaction.

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Cryptography

Cryptography means the use of public and private keys to facilitate the secure transaction. In Blockchain, each transaction in the network is protected by cryptography. The sender publishes the message in the network indicating the transfer of digital property/ rights, along with a reference to the transaction that verifies the ownership of the sender. The sender also indicates the portion of his existing property/rights being transferred and the public keys of the intended receiver which serve as account number.

Timestamping

Timestamping means assigning of a sequential identifier to each verified transaction in the network. It is done primarily in order to prevent the problem of double spending in the case of digital transactions.

Proof of work

Blockchain technology leverages Proof of work system to verify the transaction blocks. Proof of work is actually a solution to a kind of random mathematical puzzle assigned to each transaction; the miner is required to solve this puzzle to verify the transaction. One could imagine it as a much difficult version of captcha, which is generally used to deter denial of service attacks or spam e-mails. The miner uses computationally intensive methods to solve this puzzle and upon solving it, publishes the "block" containing a proof-of-work that is solution to the problem and a reference to the previous verified block in the network. After which, other miners verify the solution, and start working on the new outstanding transactions.

Benefits

- Secured transactions
- Speedy transactions
- Reduced cost per event
- Transparency
- Unforgeable identity and transaction records
- Better governance
- Fewer probable errors
- Minimisation of Frauds

Exploring the Application of Blockchain Technology

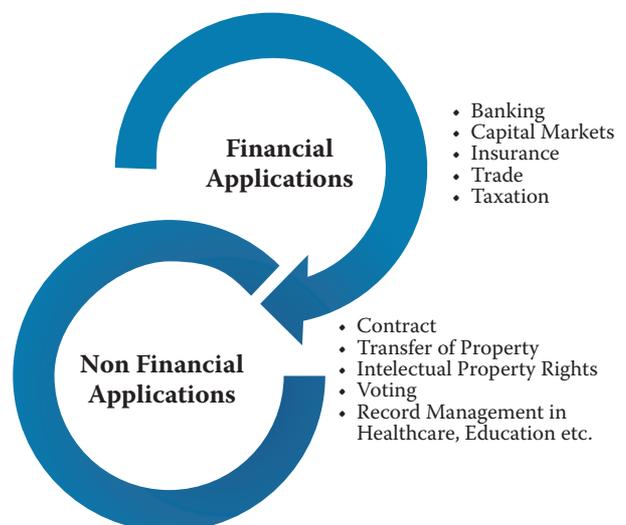
Governments, Regulators and Companies across the globe are showing enthusiasm to adopt this new

concept in their external and internal processes to ensure transparency, security and efficiency and India is no exception to this.

Though as compared to the global trends, India has witnessed relatively muted growth yet, the evangelist in the space of technology view that the growth in this space is now steadily catching up with some regulators, banks, supply chain firms showing interest in exploring the technology.

Earlier in December, 2013 the Reserve Bank of India (RBI) has cautioned the participants involved in the Virtual Currencies (VCs) transactions (including bitcoins), about their potential risks. The RBI emphasised that it is examining the legal and regulatory framework of the country, including foreign exchange and payment laws and regulations. However, with banks and businesses investing heavily in exploring ways of leveraging Blockchain, it could be assessed that though the impression of bitcoin is not that good, the stance of underlying Blockchain technology seems to be untarnished in India.

Due to its features, it could be used in the cases where (i) there is need for recording and verifying chronological events; (ii) transparency is to be ensured; (iii) intermediation is involved; or (iv) decentralising the processes (in a permissioned or a permission less manner) would enhance the efficiency. Some of the compelling financial and non financial application of Blockchain particularly in the context of India are discussed under:



- Banking
- Capital Markets
- Insurance
- Trade
- Taxation

- Contract
- Transfer of Property
- Intellectual Property Rights
- Voting
- Record Management in Healthcare, Education etc.

Application of Blockchain Technology

Financial Applications

With the great volume of financial transactions being conducted daily, finance is undoubtedly one of the most fragmented, dynamic and complex system in the global economy. Blockchain could be viewed as a technology with probable role in standardising and simplifying this system. It also has potential of enhancing efficiency and effectiveness of financial transactions in multiple domains including banking, insurance, capital markets, etc.

1. Banking

In the Banking system, Blockchain could have use cases in the core and allied banking activities involving Letter of Credit, Loan Disbursement, facilitating identity management by use of unified Know Your Customer (KYC) norms, real time settlement of Inter and Intra Bank transactions, Asset Financing, Cross border payments, etc.

In fact, some of the major Indian banks have been showing their keenness to adapt this new technology by making significant investments in exploring the convincing use cases. For example, ICICI Bank became the first bank in India by piloting and executing successfully cross-border open account remittance transaction using Blockchain network with Emirates NBD as a partner in October, 2016. Thereafter, two more private banks, Yes Bank and Axis Bank have joined this bandwagon by offering/ announcing to offer Blockchain based remittance solutions. Bank(s) in India are now akin to further explore the use cases for its implementation in trade finance, letter of credit, documentation and record management etc.

Recently, The Institute for Development and Research in Banking Technology (IDRBT), the Reserve Bank of India (RBI), has also released its first major white paper focusing on Blockchain and its application in banking and financial sector. Apart from an analysis of the said technology

and its application in financial sector, the paper also highlights the experience of the Proof-of-Concept (PoC) attempted to analyse the feasibility of applying it in Indian Banking Industry. The paper emphasises that the key parameters assessed during the PoC were workflow validation and ease-of-use whereas scalability and security aspects would require a further in-depth study.

Key Benefits that the banking sector could expect through the use of this technology, *inter-alia*, includes reduced cost of compliance, removal of the duplication of effort in carrying out KYC checks, real-time of transactions, reduced paper work, reduction of operational cost/ lesser probability of errors and frauds. This technology could bring down the cost of transactions to a great extent and assist in nationwide financial inclusion.

2. Capital Markets

It is notable that Nasdaq, the world's second largest exchange, recognised the scope of Blockchain technology in its nascent stage and has already begun the process of exploring the possibilities of worldwide implementation, *inter-alia*, in the form of distributed ledger that could be used to improve proxy voting, company registration and public pension registration, digitally represent share ownership. Nasdaq is expecting enhanced efficiency, transparency, auditability and governance to be the foremost virtues of this disruptive technology.

Further, Overstock.com distributed more than 126,000 shares via Blockchain technology and thus became the first publicly traded company to issue stock over the Internet. Patrick Byrne, CEO, Overstock.com is of the view that this technology could significantly streamline all sorts of activities taking place in the capital markets.

Taking cues from the advancements in the most developed capital markets, India could also utilise the Blockchain technology in streamlining its pre trade, trade and post trade activities in the capital markets and optimising settlement time. Some of the activities in capital markets that could leverage this technology include, Identity management, automated compliance, Trade-allocation, administration, bond trading, IPO, contracts for derivatives, auto-execution of contracts, real time settlement, etc.

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Indian Capital Markets could also gain significantly from this technology and expect benefits like reduced duplication of work, simplified accounting, speedy settlements and synergising the overall activities of stock exchanges.

According to Johann Palychata, BNP Paribas, there could be two scenarios for Blockchain-based securities markets, first being total disruption in the form of a Decentralised Securities Depository system and second being an integration of this technology within the post-trade ecosystem.

3. Insurance & Other Social Schemes

Embracing an industry-wide standardised peer-to-peer network for handling and management of insurance products and settlement of claims could render a significant efficiency quotient to the insurance industry in terms of streamlined payment of premium, speedy disbursement of claims, reduced fraudulent claims etc. The insurance industry could utilise Blockchain for varied activities which may *inter-alia* include Identity management, Smart Contracts with inbuilt conditions, Triggering of payments, direct disbursement of claims/benefits etc.

4. Industry wide Accounting & Financial Planning

The Blockchain technology could lead to a radical change in the manner business accepts payments and maintain their books of accounts. Businesses could apply Blockchain technology for making real time accounting entries, automating collection, execution of contracts/transactions, netting and reconciliation of transactions etc. This in turn would assist businesses in shortening their trade cycles, reduced redundancy and delays in transaction and payment cycles, access to global markets, immediate settlements, lower counterparty risk, transparency etc.

5. Taxation

Blockchain could benefit the taxpayers as well as the tax authorities by facilitating real-time tracking of transactions, easy tax management, saving the collection/payment cost, and enhancing transparency. The OECD, in its report, Technologies for Better Tax Administration claimed it as one of the most promising technologies that could be used by the tax administrations to enhance the transparency and streamline the overall taxation system.

Tax Authorities could use this technology in direct as well as indirect taxation to counter tax evasion, broaden tax base increasing the efficiency, speediness and transparency in the tax levy, collection and control process.

OECD has also proposed the application of the distributed ledger to bring about significant improvements in the public sector in the matters relating to consolidation of accounts, efficiency in resource allocation by enhanced transparency and auditability.

Non-Financial

Apart from the major financial application of Blockchain, discussed above, there could be a variety of non-financial applications of this technology; some of the major applications have been discussed under:

1. Contracts

Contracts could be made based on the programs that automate the execution of the pre-configured terms and condition of a contract in a transparent and efficient manner requiring no manual verification, eg. Financial derivatives' tenders etc. This would enhance the efficiency in execution of contracts and reduce the chances of human error.

2. Transfer of Property

Blockchain technology could be used in creating a record of ownership that maintains the record of true ownership and transfer of property. Hernando De Soto, renowned economist even presented his plan wherein he has claimed that, use of Blockchain technology in maintaining the record of title to property at global level could help free up \$20 trillion of "dead capital" which could be used for better purposes.

3. Intellectual Property Rights (IPR)

Blockchain would also make licensing of IPR a lot easier. It may be used to allow the use of intellectual property by directly paying the owner without the need for an intermediary or to facilitate detection of duplicate content in various forms and alerting the original poster of the violation. It can also be used as an inbuilt application that runs in the background and allows automatic tracking of duplication in any form of IPR and thus allowing in taking appropriate action.

A large scale use of Blockchain Technology in India still seems to be distant dream as of now as the industry, Government and regulators may not embrace this technology with open hands without conducting due diligence and be assured of its robustness

4. Education

Education could see massive changes with the application of Blockchain, few use cases assisting education industry could be maintaining of distributed network of educational institution to allow sharing of knowledge or maintaining of academic records to avoid forgery. Example: Holberton School in California has applied this concept for encryption of academic records.

5. Healthcare

Healthcare can also make use of this technology

by providing a network where different providers could communicate more effectively, maintain or share medical records or cases, maintaining privacy and thus raise the standard of medical advancement in the nation. Recently, a new initiative has been announced wherein, U.S. Food and Drug Administration and IBM Watson Health will be collaboratively exploring its potential use in exchanging patient-level records and information in an efficient and secure manner to promote the advancement in public health.

A large-scale use of *blockchain technology* in India still seems to be distant dream as of now as the industry, government and regulators may not embrace this technology with open hands without conducting due diligence and be assured of its robustness. It seems rational to approach this new technology on a large-scale with caution giving due attention to the probable consequences of adopting the technology. ■

