THE WORLD OF BLOCKCHAIN

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INTRODUCTION

Funny, but true. I had always wanted to be known as a wealthy woman someday, and ever since those early years have left no stone unturned to transform my dream into reality. But then my next question was: How was this hard-earned money to be kept safe? My grandfather was the first person to have advised me to invest, rather than merely save. 'Wealth in no form is safe, my dear; safety in money matters is just an illusion,' he used to say. From him I heard the history of trading, the barter system, the evolution of banks, and how demonetisation and remonetisation occurred so many times in human history. I gradually applied that knowledge to the IT industry, my work place. People who regard the paper notes in their wallets as money should think again. Without the emblem of a king or ruler, notes or currencies, in themselves, have no inherent value. Therefore, finance advisors tell us to invest our hard-earned money in various ways: real estate, diversified stocks, gold, banks, among others. The issue is that in the 21st century, even though most of the countries in the world are democracies, money continues to be handled in an autocratic manner—with the involvement of banks, central banks and governments.

To resolve some of these issues, the Bitcoin network was introduced almost a decade ago by an anonymous Satoshi Nakamoto. Bitcoin is nothing but an alternate payment mechanism, where two different users can exchange digital money without the involvement of a third party like a bank. Surprisingly, Bitcoin is neither the first digital currency nor the first crypto currency,

as many might believe. However, the revolutionary concept that it used was the decentralisation of consensus. Unlike banks or financial institutions, where transactions are validated by a central server of rules and regulations, there is no such central authority for Bitcoin. But then, who would validate all the user accounts and the sanity of transactions? In traditional mechanisms, such as used by banks, it is done by an inherent software which verifies the validity of users through a Know Your Customer (KYC) process, to ascertain if they have sufficient funds for transactions. The banks often charge a fortune for their services, especially for international transactions. Moreover, international remittances take a long time to clear. With the Bitcoin network, this can be done in a very short time, and its transaction charges are almost negligible. However, the verification is done in a decentralised way, by which most of the active users in the network validate the transaction and vote for its validity. The technology that supports the Bitcoin network is called Blockchain.

In recent years, the hype surrounding crypto currencies first saw a surge, which then gradually subsided. However, Blockchain as a technology is still in its infancy. According to a report by research institute International Data Corporation (IDC), spending in Blockchain projects across the world is growing at the unbelievable rate of 81.2 per cent, and will reach $9.7 billion by 2021. No matter the industry under consideration, this emerging technology is ultimately bound to disrupt all verticals. Therefore, some technical understanding is desirable in order to stay updated with the market.

WHAT IS BLOCKCHAIN?

Blockchain is an emerging technology with two different parts: the ledger, and the smart contract.

THE LEDGER

Blockchain is a distributed decentralised ledger, or a special type of database, where transactions can be executed in an append-only mode (i.e., with no updates and no deletes, and therefore resistant to modification). Blockchain is usually used in specialised scenarios where multiple parties, or organisations, need to work together to execute complex business transactions. In such scenarios, the network takes care of the transactions, data replications, and the

security and privacy of data. The parties can use this ledger as a single source of truth, no longer needing to keep their individual replicas of data. Using Blockchain as a ledger for a single party would be overkill.

SMART CONTRACT

'Smart Contract' is a computer protocol or computer programme that digitally verifies or enforces the rules and regulations of a physical contract. It leads to the automatic execution of complex multiparty transactions between parties, minimising human intervention, saving time, cost, and the complexity of maintaining data.

USING BLOCKCHAIN

Blockchain, although introduced through Bitcoin, actually entered mainstream business as recently as 2015. The evolution of technology and platforms interested leaders in different business verticals in this technology. Although the implementation initiative was taken by the finance industry, others joined hands gradually to make it an overall success.

IN FINANCE

The first Blockchain products were the creation of many new crypto currencies through Initial Currency Offering (ICOs). As with Initial Public Offerings (IPOs), people started gathering crypto currencies for their new ventures, through ICOs. Today, there are thousands of crypto currencies flooding the market: Ethereum, Ripple, Stellar, EOS and Neo being the most popular.[1] Ripple and Stellar are used for international remittances, which once took several days, with high bank transaction costs. Moreover, these new remittance facilities have made it faster, easier and cheaper to process. The ICICI Bank successfully attempted international remittance with Emirates NBD bank in the Middle East two years ago.

By using Blockchain, one can exchange money, property, utilities, services, shares, or anything of value in a transparent, conflict-free manner, avoiding the need for middlemen. Blockchain benefits banking-use cases, such as syndicate loans, trade settlements, interest-rate swapping, home loans, credit reporting, money markets, micro-finance, etc., where multiple different parties are involved. In such cases, the benefits offered by Blockchain

are traceability, transparency, real-time settlement and auditing, among others.

IN THE INSURANCE FIELD

Today, organisations the world over are exploring the improvements brought about by the use of Blockchain to the automation of complex and manual processes in the insurance industry. Even if many of these processes are digitised, the sharing of data between different parties—airlines or hospitals or agricultural co-operative societies—in insurance claim processes may be realised with the help of Blockchain. End-to-end process tracking would be straightforward for such workflows for all stakeholders, bringing ease of business, transparency and trust to the entire ecosystem. Some very popular applications of Blockchain in the insurance domain are to fraud detection and risk prevention, property and casualty insurance, healthcare and re-insurance, among others.

IN HEALTHCARE

In the healthcare sector, Blockchain's worth is projected at $176.8 million in 2018, and is estimated to grow to over $5.61 billion by 2025. Healthcare is often associated with multiple parties, such as hospitals, labs, manufacturers, storing houses, retailers, etc., and therefore many suitable use-cases can be formulated in this vertical: the provenance of medicine, medical insurance processing, global health governance being some of them.

It is well known that certain medicines, such as those used in chemotherapy and critical care, have to be manufactured and stored at a certain temperature range. Any variations in temperature would lead to breach of contract. Today, even if medicines come with a manufacturing date and a few details, an end-user has no mechanism to track these facts. With the help of IoT (the Internet of Things) sensors, the temperature and location of medicines can be tracked and stored in a Blockchain immutable ledger. At the time of purchase, the buyer can use the medicine's barcode to retrieve all the information with Blockchain-based tracking software.

Similarly, authentic medical reports of patients can be shared easily between hospitals, labs and research institutes on a Blockchain ledger. This would lead to global health governance, where patient records can be traced from womb to graveyard. The tracking of

disease breakouts, prevention and patient records would be done seamlessly through a common shared ledger.

IN TRAVEL

In the travel domain, Blockchain can be used extensively in two cases: the unification of loyalty points, and the replacement of Global Distribution Systems (GDS).

Loyalty points are commonly disbursed for hotel stays, for travel by air and train, for buying commodities from retail stores, and for fuel purchases. According to research, up to 10 per cent of these loyalty points are wasted as they are not integrated with a mainstream system; people forget to apply and ultimately miss availing of the benefits, and the points go unclaimed. With Blockchain technologies, stores, hotels, airlines and service providers can unify their loyalty points against a single user so that the points are not wasted.

Relevant to the travel domain are global distribution systems, such as Amedius, Sabre and Alibaba, which are huge middleware systems that aggregate data from hundreds of airlines and thousands of hotels, and provide a search facility in a single window. However, GDS systems come with two major shortcomings. First, they provide us cached data in search results. One is familiar with scenarios where airfares in flight search results might seem different from payments finally made—i.e., a price during final reservation at variance with that seen in the search window. This is because the searched data come from GDS, while actual reservation takes place directly on airline websites. Second, GDS systems charge approximately 5 per cent of each transaction, which is a huge amount. Organisations such as Winding Tree are building Blockchain platforms which can replace GDS systems, so that complex multiparty reservations (airline + hotel + ground services) can be made cheaper, and always with the availability of data in real time.

BY GOVERNMENTS

Governments worldwide are prime investors in Blockchain technology. While some countries have made payments in certain crypto currencies official, others have embraced Blockchain in complex business processes, such as land registry, e-voting and many more workflows between internal departments. In India, the state

governments of Telangana, Andhra Pradesh and Maharashtra, among others, have already initiated their Blockchain projects in property transactions; other state governments are soon to follow. In the Swiss city of Zug, the city authority is using Blockchain for digital identity and e-voting. The United Arab Emirates is one of the biggest and earliest adopters of this technology, which is being used to revolutionise government processes and citizen services along with a few other emerging technologies.

IN EDUCATION

Today, organisations spend a fortune on background verifications before officially boarding an employee. These verifications are to be found in a variety of certificates: birth, passport, education, work experience, among others. Blockchain ledgers can be used in this scenario, and the data can be shared by universities and organisations on a need-to-know basis. Blockchain technology will ensure the impossibility of faking a degree in industry, and serve to reassure an employer about an employee's authenticity.

IN TELECOM

According to one report, Blockchain in the telecom industry will become a $1 billion industry by 2023, supporting OSS/BSS (Operations Support Systems/Business Support Systems) Processes.[2] This industry often face issues of trust and transparency because of the involvement of multiple entities as partners, vendors, customers, distributors, network providers, VAS (value-added service) providers, among others. The tracking of devices too is a major challenge for roaming and billing services. Blockchain can help track devices on the basis of their connections to hotspots and Wi-Fi. Moreover, mobile and micro payments can be made much easier with Blockchain as an alternative to established intermediaries.

IN AGRICULTURE

Blockchain can be a huge enabler in the supply chain domain. Although this mechanism can be used in many different industries, for the moment let us consider agriculture.

According to the Food and Agriculture Organization, up to 30–40 per cent of agricultural produce is damaged.[3] Lacking an efficient supply chain and provenance tracking, the

agricultural sector, typically, has very tight margins. This leads to wastage and low incomes, resulting in numerous suicides among farmers. Smart agricultural solutions, with the help of Blockchain and IoT sensors, can boost productivity and address the food demand.

Globally, the Blockchain market in the government sector is expected to grow from $162 million in 2018 to $3,458.8 million by 2023, at a Compound Annual Growth Rate (CAGR) of 84.5 per cent during the forecast period. Food safety, traceability, lower transaction costs, logistics, as well as new markets and business models, are some of the promises of this technology. Some advantages are:

- Information about the entire cycle of agricultural events can be put onto Blockchain to enable a transparent and trusted source of information for the farmers.
- Logistically, Blockchain can speed up the movement of food through the supply chain network (critical for perishable goods), and also allows fast and targeted removal of products that are unfit for consumption. Food waste is thus reduced through both methods.
- Farmers can access instant data related to seed quality, soil moisture, climate and environment-related data, payments, demand and sale price, etc., all on one platform.
- Blockchain will help in establishing direct links between farmers and consumers/retailers, thus eliminating middlemen.
- The source of infected food items can be tracked for food safety and control.

This will address and reduce the problems of poor income as Blockchain ensures transparency in the supply chain, enabling farmers to get the best price for their produce. FeshSurety, AgriDigital, HarvestMark, FoodLogicQ and Ripe.io are a few start-ups across the globe that have successfully implemented Blockchain solutions for their products in the AgriTech domain, and have been awarded for their innovation. India would do well to be empowered with these latest technologies to upgrade age-old agricultural ecosystems.

In comparison to other such emerging technologies as artificial intelligence and IoT, among others, Blockchain, while still in its infancy, is growing exponentially towards adulthood. While many organisations are still learning or creating proof of concept prototypes, leading organisations such as FedEx, Burger King Russia, IBM, Walmart, MasterCard, Overstock, Huawei, Bank of America, among others, have spent a fortune on research and development of this technology. Many countries and organisations across the world are now accepting crypto currencies as legal payment. Deloitte and IBM have predicted that 10 per cent of global data would be stored on Blockchain ledgers in less than a decade. Such a massive shift in technology can only be enabled by a huge talent pool from industry. A recent news item in *The Economics Times*[4] says that in India, barely one in 400 in the IT industry has Blockchain skills, and hence many projects are not actually being executed in India because of lack of expertise. It is to be hoped that industry and academia will take proactive steps in educating the workforce at every level to match this revolution brought about by the massive demand for Blockchain.

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NOTES

1. https://coinmarketcap.com/.
2. https://www.marketwatch.com/press-release/blockchain-in-telecom-global-market-to-exceed-990-million-by-2023---increasing-support-for-ossbss-processes---researchandmarketscom-2018-07-11. See also https://cointelegraph.com/news/blockchain-in-telecoms-will-become-1-billion-industry-by-2023-report.

   The two systems, OSS and BSS, operated together by telecommunications service providers, are used to support a range of telecommunication services. See https://www.ossline.com/2010/12/definition-oss-bss.html.
3. This is worldwide, according to the UN. See http://www.fao.org/in-action/seeking-end-to-loss-and-waste-of-food-along-production-chain/en/. Updated from the study 'Food and Agriculture Organization of United Nations'.
4. https://economictimes.indiatimes.com/tech/software/one-out-of-every-400-indian-developers-can-work-on-blockchain-research/articleshow/64099262.cms.

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