A

REPORT

ON

BLOCKCHAIN AND DISTRIBUTED LEDGER TECHNOLOGY

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Abstract

This report discusses about one of the projects given under Practice School - 1 at the International Centre for Entrepreneurship and Technology (iCreate). The main objective of the project was to study Blockchain and to identify feasible, sustainable and profitable applications of blockchain technology for the Indian ecosystem. Due to the government discouraging cryptocurrencies, we were to find such applications that did not depend on any kind of cryptocurrencies or tokens to generate money. We studied various applications and compared their working with and without blockchain. We worked to find contacts of startups and organisations that had already implemented or were implementing Distributed Ledger Technology to discuss the potential advantages of blockchain. We discussed Hyperledger Fabric and Supply Chain Management in the Indian ecosystem with Mr. Rajesh Kumar, the CEO of Brainy IoT. We further discuss the economic viability of blockchain, its ability to save money and the increased costs of maintaining a blockchain in place of a normal database.

About iCreate

iCreate (International Centre for Entrepreneurship and Technology) is an autonomous institution that identifies, nurtures and mentors the spirit of budding entrepreneurs and provides them with all the assistance one requires during the entrepreneurial journey. Their aim is to produce successful businesses. iCreate is a relatively new organization, with its foundation set by the Prime Minister (then Chief Minister of the State of Gujarat), Narendra Modi in 2011.
Some of the startups that they are currently working are includes a drone which can help map 3D models of terrain, which would make the requirements of UAVs redundant. Another of their startup which is trying to create a device which works on the principles of ayurvedic treatment and helps in treating patients.

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Introduction

This report provides a synopsis for the project whose purpose was to delve deeper into the fundamentals of blockchain technology, an emerging trend in today's world, understand the working of blockchain networks, identify promising applications being deployed in countries around the world, and develop a basic template based on these applications which can be implemented in India. The profitability of the findings were to be accounted for verify the feasibility of the proposals.

Blockchain technology ensures data immutability, security, peer-to-peer connectivity, which are features that can revolutionise the working and efficiency of businesses, and various other sectors including finance, supply chain management, digital taxation, healthcare, besides others.

An additional undertaking to increases know-how on the concept of using blockchain as a business tool was taken by organizing sessions with Mr. Rajesh Kumar, founder of a startup Brainy IoT, founded on the basis of providing business solutions to combat shortcomings in their current systems, which resonated with the core task of this project.

The research was carried out extensively using content on the internet such as articles, blogs, educational courses, as well as regular discussions held amongst the group. During the course of the project, multiple areas of application were recognised, which have been duly summarised in the report.

About the Study

Study Design and Methods

The main objective of this study conducted over a few week period was to find sustainable and profitable applications of Blockchain or Distributed Ledger Technology. We started with gaining a deeper understanding of the DLT, which included hashing, proof of work (PoW), proof of stake (PoS). To aid this understanding, we analysed the bitcoin blockchain and how Proof of Work is implemented and how it has been made secure. This enabled us to identify some of the possible applications of blockchain.
We then analysed the application on how it would help an organisation in saving and/or generating money. We compared the classical process, and the process including the DLT. We also tried to contact some startups working on blockchain technology.

Limitations of Analysis

There is an increasing body of information on DLT/Blockchain available in the public domain and the literature frequently tends to discuss future or potential opportunities and challenges. We believe that this is an inherent characteristic of the topic, which is in a nascent stage of development and has recently been receiving a growing amount of attention in the media. Additionally, the study was not intended to cover detailed issues related to the technical and implementation aspects of DLT/Blockchain. The analysis therefore does not discuss these points in detail but, rather, focuses on the market issues related to DLT/Blockchain.

Blockchain

What is Blockchain?

Blockchain is a continuously updated record of who holds what. It is a decentralised digital ledger which keeps track of any trade or transaction of any kind. A blockchain consists of blocks which in turn contain data, their hash and the hash of the block that comes just before them in the chain. The data can be anything depending on where the blockchain is being used. The hash is used to uniquely identify a block. The hash of a block changes when the data in the block changes.

Blockchain's first known form was of a digital timestamp system from 1991 that was used to timestamp digital documents so as to prevent backdating and tampering. This was later adopted by Satoshi Nakamoto in 2008. Using this technology, he (or they) created the world's first digital cryptocurrency, Bitcoin.

Blockchain is one of the most popular/talked about technology today and has been compared to the internet. The high exchange rates of cryptocurrency have brought Blockchain, its underlying technology into the spotlight. The applications of blockchain are just being realised, and it is being tried to integrate it with many existing technologies. This has also created a fear in some minds of whether it is just a bubble like the dot com bubble.

Advantages of Blockchain

- Robustness: It cannot be controlled by a single entity. It is decentralised which means that it is distributed among multiple nodes (users/computers) and hence there cannot be a single point of failure.
- Secure: Each and every block on the blockchain is distributed to all of the nodes, so if one of the user tries to tamper the data, when validated with the other nodes' data, the tampered block will be rejected.
- Transparency: The entire blockchain is copied at every node. This means that all the transactions are visible to all the nodes/users and nothing is kept hidden. (This might also be a disadvantage in some cases)

Disadvantages of Blockchain

- Once something is added to a blockchain, it is very difficult to remove or modify it.
- Energy-intensive nature of the technology: Every Node runs the blockchain in order to maintain Consensus across the blockchain. This is wasteful, as each Node repeats a task to reach Consensus burning electricity and time on the way.
- Each block increases the size of the blockchain, as every node must have the entire blockchain, with each use the computation power required increases.

What makes blockchain secure?

The idea of consensus among all the nodes to validate the integrity of the block is an ingenious one. In a chain, if one of the nodes modifies some of its data, it is then checked against all the other nodes on the network. When it does not match, then the node is in a way ousted. The only way to actually change some data on the blockchain would be to simultaneously change it on the majority of the network. This is known as the **fifty-one percent attack,** it says that if one entity holds the control of over fifty (or rather fifty-one) percent of the network, then it has the power to modify the blockchain. Although theoretically possible but gaining the control of more than 51% of the network is no joke, with the ever growing number of nodes in popular blockchain based cryptocurrencies like Bitcoin make it basically impossible. A highly dramatised version of the fifty-one percent attack is depicted in the last episode of the fifth season of the HBO TV series Silicon Valley.

Apart from the consensus, there are also the hashes which act as a link between the blocks to form the blockchain. A hash is a string of a constant length, which is calculated from data passed through it. What makes a hash secure is that unlike encryption, it is irreversible. Each block consists of the hash of the block that comes before it in the blockchain, the data, the nonce number (which plays a role in Proof of Work), the timestamp and its own hash. The hash of a block can be calculated by passing all of these data into an algorithm like the SHA256 algorithm.

```
calculateHash(){
    //Takes in the properties and creates a string based on them
    return SHA256(this.previousHash + this.timestamp + JSON.stringify(this.transactions) +
    this.nonce).toString();
}
```

Whenever the data of one of the block is changed, the hash of that block is recalculated, this in turn creates an inconsistency between the actual hash of the block and the hash mentioned as the *previousHash* in the next block. It is then required to recalculate the hashes of all the blocks that follow that block. There are computers today fast enough to calculate a lot of hashes. A GeForce GTX 1070 can calculate 32 Million hashes in a second.

To tackle this problem, a concept called **Proof of Work** has been introduced. PoW limits the calculation of the hashes to a certain number. For example in the case of the bitcoin blockchain the proof of work limits the creation of blocks to one every ten minutes. This is implemented in the bitcoin blockchain in a validation where the hash of every block must begin with a certain number of zeros. The number of zeros define the difficulty of the hash calculation. The thing is that if we pass the same data through one hash calculation algorithm, it will always return the same hash. To handle this problem a random number called the **nonce** is also passed to the algorithm, which is varied till a desirable hash is produced. Bitcoin's hashes begin with 16 zeros,

which slow down the hash calculation and hence block creation. This prevents powerful computers from taking down a blockchain and makes it secure.

```
mineBlock(difficulty){
    while(this.hash.substring(0, difficulty) !== Array(difficulty + 1).join("0")){
        this.nonce++;
        this.hash = this.calculateHash();
    }
    console.log("Block Mined..Hash: " + this.hash + " at Nonce Value: " + this.nonce);
}
```

A simple proof of work algorithm

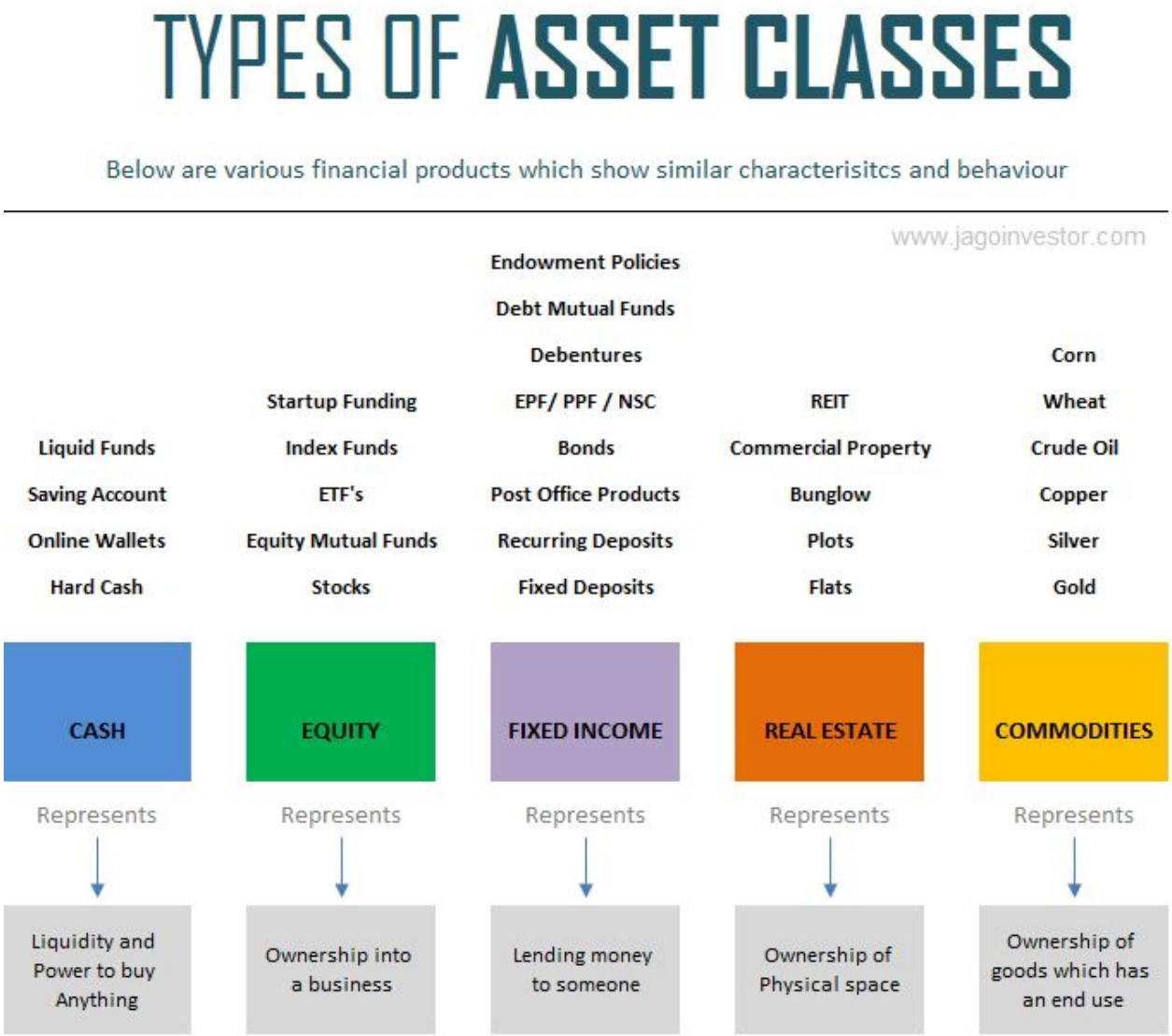
Benefits and Opportunities of Blockchain

- Providing efficiency gains (including cost savings) for businesses and end-users
- Improving security in transactional systems
- Empowering end-users and improving trust in transactions
- Offering benefits for recording and reporting of data and activities through immutability capabilities

Asset Management

What is Asset Management?

An asset is anything of value that in the future can generate cash flow, reduce expenses, improve sales, regardless of whether it's a company's manufacturing equipment or a patent on a particular technology. Assets are owned by individuals, businesses and governments. For a company, assets are reported on its balance sheet.



Problems with the current system

1. Asset transactions and records are written on paper and not updated very often, leading to innumerable property disputes. The failure to keep the registry updated results in numerous loopholes in implementation of government policies, along with various property disputes.
2. Taxes levied upon a citizen are completely dependent on the written and/or centralized database of their assets. Due to ease of tampering, these centrally stored databases are prone to manipulation, and subsequent tax evasions.
3. The same system applies to commercial firms where frauds and tax evasions are rampant.

Need for blockchain

1. In an increasingly digitizing world, use of archaic systems for monitoring property and assets of billions of individuals requires huge manpower and immense trust in the system, a task that the government has failed to carry out.
2. Increasing in frauds and use of shell companies for tax evasion call for higher level of transparency in the manner of information storage.
3. Increase in security of stored information in order to eliminate/minimize the possibility of tampering.

How will blockchain be implemented in the use case?

Asset and wealth declaration platform, where a ledger is maintained on the property and assets owned by an individual will help curb corruption, fraud, tax evasion; help in implementing government policies such as reservation-based admission into various institutions/ organisations, tax collections, along with bringing in absolute transparency in various procedures and will also help to curb the number of property disputes among people due to misinformation or inadequacy in regularly maintaining/updating their registries.

Besides the obvious use cases, information and documents on assets are also required for banking purposes such as calculation of cibil score for issuing credit card, analysis of financial background before issuing loans and interest rates, and a similar process for confirming insurance claims, all of which fall prey to forging and tampering of documents.

Although blockchain cannot prevent the crime itself, it can go a long way in ensuring verifiability and security of documents.

Is there a Market for the benefits gained?

Secure data storage, data immutability and reliable sources of information ensure increase in revenue for government, prevention of tax frauds and saving public money (wasted on otherwise ineligible claims to govt schemes) since companies and government processes linked to assets are subject to enormous financial losses, which can be effectively curbed using the distributed ledger system of blockchain.

Supply Chain Management

Problems with the current Supply Chain

The biggest challenges at present in the marketplace is ensuring transparency and establishing trust between the stakeholders who have only communicated digitally and have in some cases never actually met.

Large companies like Nike and Apple, who sell premium products face reduced sales due to counterfeiting and fake products sold in their name. Fake products also cause an overall harm to the brand image of the companies.

Another issue that the current supply chain system brings up is that of origin. If some part of some fruit crop has been infected with some disease, it is very hard to pinpoint its origin and usually takes a lot of days with the current system of supply chain.

How can Blockchain improve it?

Blockchain can increase the efficiency and transparency of supply chains and positively impact everything from warehousing to delivery to payment.The very things that are necessary for reliability and integrity in a supply chain are provided by blockchain. Blockchain provides consensus—there is no dispute in the chain regarding transactions because all entities on the chain have the same version of the ledger. This erases the trust factor when two parties interact in the supply chain. Records on the blockchain cannot be erased which is important for a transparent supply chain.

Fraud Prevention

Ad Fraud

What is Ad Fraud?
Advertisers pay for ‘impressions’ generated by search engines. Ad fraud does not affect small campaigns but for very big companies that most complex programmatic campaigns are aimed at a certain audience and are priced accordingly, this means an advertiser is wasting money.
So it shouldn’t come as a surprise that some people are trying to get a slice of the pie —and do not always employ honest methods to do so. GroupM experts expect that 20 percent of all digital advertising spending is fraudulent or inaccurate. Which means advertisers are paying for ads that were never shown. Globally over 7 million dollars {1} are wasted this way every year.

How to prevent it?
Implementing blockchain technology. Using a distributed system, advertisers will have the chance to audit every ad or every impression and pay only for the right ones.

Who will benefit from this?
All the advertisers will be benefited for they will only be paying for the actual impressions and not the fake ones. The advertising firm may also benefit, for if they implement it, the advertisers trust in them which would make more advertisers comfortable with using their platform.

Is there a Market?
ClearCoin a US based startup is trying to do something similar and it has already raised about 4 million dollars and about 10,000 advertisers have signed up.

Odometer Fraud

What is Odometer Fraud?

Odometer fraud is the illegal practice of rolling back odometers. This is done to increase the resale value of a vehicle or to get servicing.

What is the current status?

Right now the distance travelled is basically a number stored digitally on the car, but Bosch IoT labs are working on a develop a blockchain based solution for tackling this. They have

connected some of their cars to their blockchain and developed a proof of work concept, with which they have developed a mobile app where you can track your mileage and other data.

Is there a market/How will it earn money?

Most of the benefits in this case are to the consumers buying second hand cars. To have just one single blockchain, it can be licensed to car companies which then add this to their cars as well. There is no explicit benefit for the car companies to do so, to check any implicit benefits, it is necessary to talk to people about it's utility versus additional cost (if any). Even in Ahmedabad, last year Ahmedabad Mirror reported last year that it is quite prevalent.

Health Care

Need for Blockchain

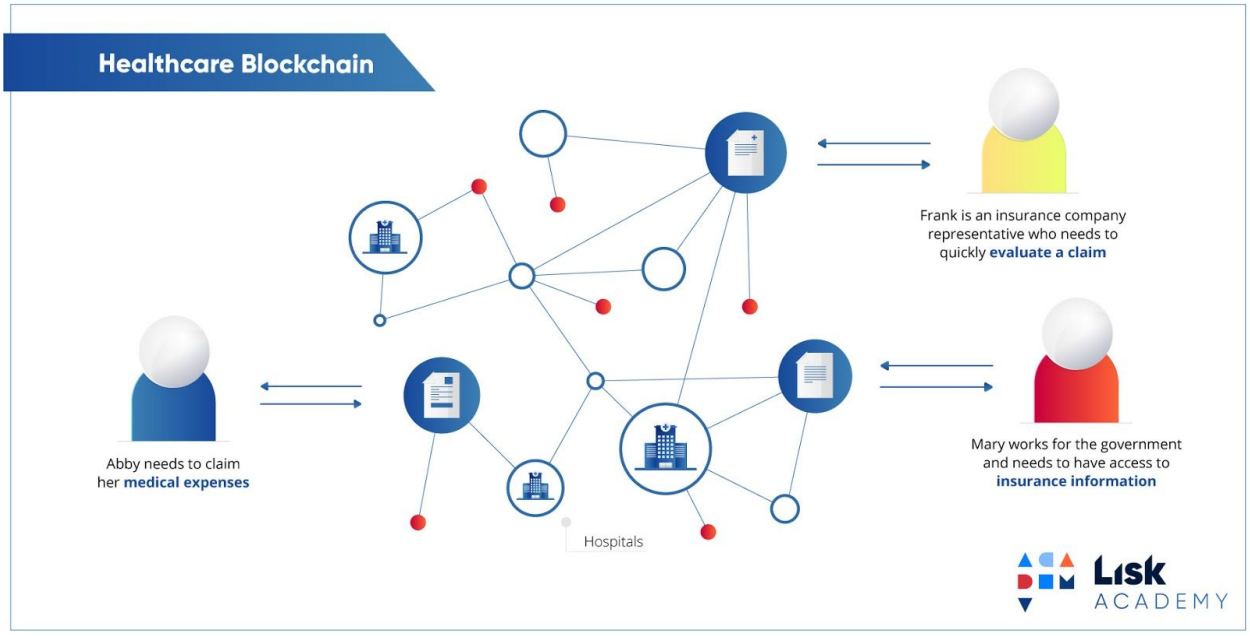
Today more and more hospitals are moving to cloud and giving access to medical prescriptions and reports through web portals. This gives rise to the need for a unified and secured platform to connect all the health care institutions. This will increase trust between them in a unified manner for patient centricity. To rule out centralised control of platform and security concerns blockchain seems a way to go.

Proposed blockchain solution

Development of patient centric blockchain platform to reduce time and resources of medical labs wasted in repeatedly performing the tests as they change their medical consultant due to unavailability of earlier reports in a verifiable format. This will also reduce recurring lab test costs for patients and will speedup the insurance claim process. This will also help in improving diagnosis with timeline of patient reports.

Is there a market/How will it earn money?

Through this blockchain based platform, patients and insurance companies are major beneficiaries, as they need not pay and reimburse, respectively, for medical tests again and again. On the other side, for hospitals, this will lead to reduction in profits.



Healthcare Credential Management

Need for Blockchain

Accurately tracking clinicians as they move through the highly regulated healthcare environment is vital for patient safety as well as for the administrative wellbeing of the healthcare organizations. Blockchain provides a distributed ledger technology to counter the complex issue of managing credential and licensure for the healthcare professionals. It provides a promise of security which will help to improve the accuracy, reliability, and timeliness of licensure and credentialing for the healthcare workforce.

Proposed blockchain solution

A program can be employed to improve the way medial credential data is stored and shared. A single provider's identity is a complex points of composite data points. Multiple disparate stakeholders hold multiple elements like medical schools, residency programs and certifying boards, while it also includes other data elements that tend to change often over the course of a provider's career such as practice and hospital affiliation, practice location and whether they are accepting new patients. This system will provide a secure, privacy-enhancing way for a state's licensure boards to efficiently manage credentialing at national scale, while also presenting health payers and provider networks a 'single source-of-truth' to improve the veracity of provider directories and claims adjudication processes.

Benefits and potential of the solution

This system will allow providers to maintain a single record of their certifications and approvals, which will streamline interstate licensure, bolster trust , and allow organizations and individuals to authenticate the professional qualifications of jobseekers and staff.

Digital Identity

Need for blockchain

The overall identity verification sector is large and growing, as a result of which security breaches, data theft and identity theft are also rising.If blockchain based solution were to be implemented, it would be very secure Also, identity verification using blockchain will be much quicker than the traditional route.

Proposed Blockchain solution

(IDV – Identity verification, PII - Personal Identifiable Information)

There are three parties in the proposed Ecosystem: (1) Validators who process the IDV request and generate the IDV result, (2) Service Providers who initiate IDV request and (3) Individual Users who are the customer of the service provider and need to give consent to validators to process the IDV request. Among others, the Validators are the backbone in the Ecosystem. The Validators may include government entities, financial institutions and utility companies among many others. Once Validators receive an IDV request against a User from Service Providers, together with consent of the same user in forms of Smart Contracts, they will process the IDV request and generate result. After that, they are able to 'stamp' their approval on the Blockchain.

Benefits of using blockchain technology

- Increased security
- Cost saving – The proposed solution will be cheaper in the long term.
- Others companies (such as mobile companies) who need identification can buy it from the platform directly with the consent of the concerned person.

Decentralized Storage and Sharing of Computing Power

In today's era, everything has became centralized. And now we are realizing the power of decentralized platform.With decentralized storage we will have access to infinite storage size and with decentralized computing we got an access to infinite computing power, it doesn't matter what hardware we operate on, the power we need to work on is there with someone else and using this platform they can share it with us. It's just like having a supercomputer with us.

Benefits of Decentralized over Centralized Network

Security : Currently, the files we own are stored on the companies server giving them the access to our data which has been hazardous in many cases. The files stored on such cloud are usually encrypted when it reaches their server and their is a chance that it will get hacked or copied in the midway. Moreover even when they keep multiple copies of the data, the software and hardware infrastructure they use are almost same for all the servers so if a hacker found a vulnerability in one of the server they can apply it to most of the others thus decreasing the security vastly. Also the failure of infrastructure due to any reason have vast and major consequences.

But what decentralized storage would do is use the unoccupied (wasted) storage on the user devices (called farmers) and will lend it to the person who need it in return of small fee. The encryption will be done on the owners end and then the file will be broken out to many a pieces and will be shared with the farmers. The farmers and owners will be bound by a smart contract which will enforces the pre-decided rules on the farmers, to regularly check whether they are storing the file safely. The contract will also contain information on how much time the data is to be stored for, when the money will be paid, etc., thus building the the trust and the credibility. The encryption key will be stored only with the owner thus any of the farmer even if he get the whole of the file, cannot decrypt it. Also the information about who all farmers have the part of the files and how much of it, is stored on the owners computer making it difficult to locate and identify the size of the file. The infractruce of the devices storing such information will differ vastly as everybody have their own taste thus making it difficult for hackers to find multiple vulnerabilities on the same time. And the failure of some of the devices would not have a huge impact as they would be storing a very little amount of data as compare to the total amount and there always be a copy of same data stored with someone else.

Cost : The cost of using decentralized platform will be greatly reduced as mentioned by one of such platform current price of using amazon web service is $25 per terabyte per month which can be reduced to as low as $2 as the competition among farmers increases.

Hosting decentralized application : Decentralized applications (DApps) built on blockchains can't be integrated with our current centralized server providers so it would also serve as a platform for DApps to be deployed on.

Speed : Since the centralized system have limited points to transfer files from, speed of transfer is limited, while through the decentralized storage, one can transfer multiple part of files from different farmers making it a lot more faster. This works the same way as torrent works.

Computing Power : A major advantage that can be incorporated in such a decentralized network is the sharing of the computing power. Same as people lend their storage taking it one step ahead people can lend their cpu/gpu helping individuals to complete their works. Things such as rendering of image or video or models take a huge amount of time in order of days on today's top class machines which is not affordable by most. So rendering a complex project on an average device is not possible so what such individuals uses is rendering farms which have many high-edge hardware to do the rendering effectively again here the security of file is compromised as well as the cost they charge is high which again can't be afforded by someone using an average device. Similar to these their other fields like big data, AI which require high end computing power and developing something complex on these is not possible on an average device pushing people to using online services and labs. All these things can be combined to form one network where everybody will contribute to each other.

Limitations

Fixing the cost of such prices in local cryptocurrency can be very devastating for network as the value of cryptocurrency vary with time and when there is huge demand of such platform, price of such services can be increased exponentially. Also the electricity used for running the machines and cost of internet may not be compensated in case of small farmers.

Business Model

In blockchain earning are mainly based on selling the softwares, making customized platforms for companies, putting a small transaction fees and mining and cryptocurrency speculation (where as the market value of the coin increases their wealth increases and in turn they can sell it to raise fund. They initially raise fund through VC or Initial Coin Offering. In the case of decentralized storage and computing, major source of income can be setting up mining devices to earn token and charging very very small transaction fees so that the service remains cheap.

Competitors

Already many competitors have come in the market but there is a lot of scope in developing them and making them even better and more user friendly.

Decentralized Cloud Storage Companies - Sia, Storj, iExec, Filecoin, etc.

Decentralized Computing - RNDR, Sonm, Golem, etc.

They are at their very initial phases and can be developed a lot. Some of them are even at their testing phase with very limited facilities.

Bibliography

Arlee Sowder, “The Harmful Effects of Counterfeit Goods”, Athens University Business Journal http://www.athens.edu/business-journal/spring-2013/asowder-couterfeit/

Biondi, Daniel, Tom Hetterscheidt & Björn Obermeier. 2016. Blockchain in the Financial Services Industry. Hewlett Packard Enterprise: http://blockchainlab.com/pdf/4AA6-5864ENW.pdf

Bitcoin. 2018. ‘Frequently Asked Questions’.: https://bitcoin.org/en/faq

Cordwell, Jonathan. 2016. Blockchain in Healthcare: SWOT Analysis. CSC Blogs, 22 January: https://blogs.dxc.technology/2016/01/22/blockchain-in-healthcare-swot-analysis/

Crosby, Michael, Nachiappan, Pradhan Pattanayak, Sanjeev Verma & Vignesh Kalyanaraman. 2015. BlockChain Technology: Beyond Bitcoin. Sutardja Center for Entrepreneurship & Technology Technical Report. Berkeley: University of California Berkeley: http://scet.berkeley.edu/wp-content/uploads/BlockchainPaper.pdf

Deetman, Sebastiaan. 2016. Bitcoin Could Consume as Much Electricity as Denmark by 2020. Motherboard. 29 March: https://motherboard.vice.com/en_us/article/aek3za/bitcoin-could-consume-as-much-electricity-as-denmark-by-2020

Greenspan, Gideon. 2016. ‘Four Genuine Blockchain Use Cases’. MultiChain [blog]: https://www.multichain.com/blog/2016/05/four-genuine-blockchain-use-cases/

Investopedia. 2015. ‘Why Is the Insurance Sector Considered a Low-Risk Investment?’: http://www.nvestopedia.com/ask/answers/051915/why-insurance-sector-considered-lowrisk-investment.asp

Mainelli, Michael, & Bernard Manson. 2016. Chain Reaction: How Blockchain Technology Might Transform Wholesale Insurance. [Long Finance report] London: Z/Yen Group: http://www.zyen.com/Publications/LongFinance_How_Blockchain_Technology_Might_Transform_Wholesale_Insurance_July2016.pdf

Redman, Jamie. 2016. ‘Estonian Health Records to Be Secured by Blockchain’. https://news.bitcoin.com/estonian-health-records-secured-by-blockchain/

Blockchain Voting: The End To End Process: https://followmyvote.com/blockchain-voting-the-end-to-end-process/

The Coin Telegraph - Big brands are now using blockchain to fight ad fraud and fake views: https://thenextweb.com/marketing-seo/2018/02/15/big-brands-are-now-using-blockchain-to-fight-ad-fraud-heres-how/

Bosch IoT Labs - How blockchain can help prevent odometer fraud:
https://blog.bosch-si.com/blockchain/how-blockchain-can-help-to-prevent-odometer-fraud/

Jennifer Bresnick, 2017: Illinois to use blockchain for healthcare management system
https://healthitanalytics.com/news/illinois-to-use-blockchain-for-healthcare-credential-management

https://thenextweb.com/marketing-seo/2018/02/15/big-brands-are-now-using-blockchain-to-fight-ad-fraud-heres-how/

{1} :
https://www.wsj.com/articles/bogus-web-traffic-continues-to-plague-the-ad-business-1453204801

Bloomberg - Use of blockchain in digital taxation:
https://www.bna.com/preparing-digital-taxation-n73014447764/

WU/NET team - Key points for implementing blockchain in taxation:
https://www.wu.ac.at/fileadmin/wu/d/i/taxlaw/institute/WU_Global_Tax_Policy_Center/Tax___Technology/Backgrd_note_Blockchain_Technology_and_Taxation_03032017.pdf

Forbes - Blockchain use cases in India in land records and private firms:
https://www.forbes.com/sites/sindhujabalaji/2017/12/28/indias-blockchain-revolution-goes-beyond-banks/#64eac3964123

PWC, United Kingdom - Combating errors and fraud using blockchain:
https://www.pwc.co.uk/issues/futuretax/how-blockchain-technology-could-improve-tax-system.html

Deloitte - Article on understanding blockchain
https://www2.deloitte.com/content/dam/Deloitte/pl/Documents/Reports/pl_Blockchain-technology-and-its-potential-in-taxes-2017-EN.PDF

Economic Times - Use of blockchain for public sector profitability in India
https://economictimes.indiatimes.com/small-biz/startups/newsbuzz/can-blockchain-be-the-beachhead-for-indias-public-sector-profitability/articleshow/62957640.cms

Economic Times - key digitisation pivot for improving India's public sector effectiveness
https://economictimes.indiatimes.com/small-biz/startups/newsbuzz/bharatchain-the-key-digitisation-pivot-for-improving-indias-public-sector-effectiveness/articleshow/63441548.cms

Whitepaper Circle - Storj
https://www.youtube.com/watch?v=Ir9cE0qZnMM