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A Study-Blockchain Technology , Applications, challenge's and it's potential impact on Business

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ABSTRACT

This report emphasizes on explaining the blockchain technology & its application fieldsand its impact on business as blockchain technology is focused around a peer-to-peer network, allowingpoolingamongtwo or more parties, the service system is selected as unit analysis to examine its potential contribution Blockchain is being termed as the fifth disruptive innovation in computing. Weekly we can say it as distributed leger of records that isverifiable& immutable. Blockchains biggest application has been cited in crypto currencies that has jumped up. As time passes blockchain as a technology will extend itself beyond cryptocurrencies simple distributed ledger storage. This study s designated to integrate developmentsin terms of putting blockchain to practice. Finance and banking are the pioneers in accepting blockchain. In many big domains experiments are done. This paper will figure out various avenues where blockchain had influenced and expected future implementations.

Keywords

Blockchain, Cryptocurrency, Blockchain technology Service system Technology impact

1. INTRODUCTION

The Blockchain

A blockchain, basically can be termed as digital ledger which captures transactions carried out among various parties in a network. It is a node to node Internet-based distributed record which includes all transactions since its formation. All members are nodes which are using the shared database linked to the blockchain,5 each maintaining an identical copy of the ledger. In blockchain entry represents a transaction which is a exchange of value between participants (like asset (digital) that embodies rights, obligations or ownership). There are many diverse types of blockchains which are being developed and tested. This general framework and approach is followed by most blockchains. [2]

. Since Launch of Bitcoin crypto currency we have seen blockchain technology into existence. To this day, Bitcoin is still the most frequently used application using Blockchain technology [3]. Bitcoin is a decentralized digital currency payment system that consists of a public transaction ledger called Blockchain [4]

The Blockchain can either be public or private, depending on the scope of its use. A public Blockchain allows all the users with read and write permissions such as in Bitcoin, access to it. However, there are certain public Blockchains that limit the access to only either to read or to write. On the contrary, a private Blockchain limits the access to selected trusted participants only, with the aim to keep the users' details masked. This is particularly pertinent amongst governmental institutions and allied sister concerns or their subsidies thereof. One of the major benefits of the Blockchain is that it and its implementation technology is public. Each participating entities possesses an updated complete record of the transactions and the associated blocks. Thus the data remains unaltered, as any changes will be publicly verifiable. However, the data in the blocks are encrypted by a private key and hence cannot be interpreted by everyone.

Another major advantage of the Blockchain technology is that it is decentralized. It is decentralized in the sense that:

• There is no single device that stores the data (transactions and associated blocks), rather they are distributed among the participants throughout the network supporting the Blockchain.

• The transactions are not subject to approval of any single authority or have to abide by a set of specific rules, thus involving substantial trust as to reach a consensus.

• The overall security of a Blockchain eco-system is another advantage. The system only allows new blocks to be appended. Since the previous blocks are public and distributed, they cannot be altered or revised. [4]

2. BLOCKCHAIN TECHNOLOGY

A Blockchain includes of two different components, as follows: 1. Transaction: A transaction, in a Blockchain, represents the action triggered by the participant. 2. Block: A block, in a Blockchain, is a collection of data recording the transaction and other associated details such as the correct sequence, timestamp of creation, etc.[6]

Characteristics of a Blockchain [2]

As a near real-time and distributed digital ledger, a blockchain has several unique and valuable Features that, over time, could transform a wide range of industries:

Near real-time settlement	A blockchain enables the near real-time settlement of transactions,thus reducing risk of non-payment by one party to the transaction.
Distributed ledger	The peer-to-peer distributed network contains a public history of transactions. A blockchain is distributed, highly available and retainsa secure record of proof that the transaction occurred
Irreversibility	A blockchain contains a verifiable record of every single transactionever made on that blockchain. This prevents double spending of theitem tracked by the blockchain.
Censorship resistant	The economic rules built into a blockchain model provide monetary incentives for the independent participants to continue validatingnew blocks. This means a blockchain continues to grow without an"owner". It is also costly to censor

Two principal characteristics are to be identified when looking at blockchain technology, namely its trust evoking and decentralized nature. Its decentralization facilitates the creation of a private, reliable and versatile environment, which is further described below. As blockchain technology is based on a peer-to-peer network [9], which combined with the technology's ability to secure interactions between two individuals by using public-key cryptography

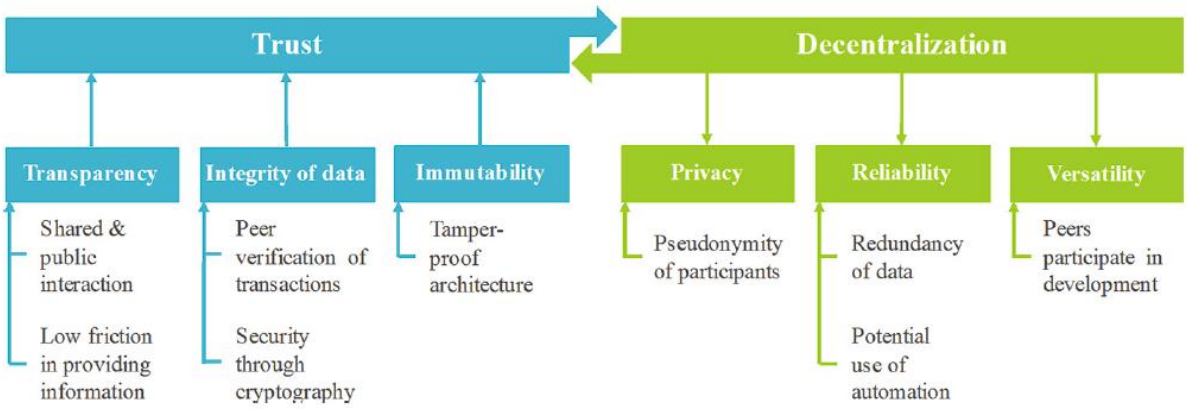

Fig. 1. Characteristics of blockchain technology[5]

2. BLOCKCHAIN APPLICATION

Where Can Blockchain Be Applied?[2]

Blockchain technology offers the potential to influence a wide range of industries. The most promising applications exist where transferring value or assets between parties is currentlycumbersome, expensive and requires one or more centralized organization. A specific activityattracting significant interest is securities settlement, which today can involve multi-dayclearing and settlement processes between multiple financial intermediaries. Certain financialservices experts believe the financial services industry is on the verge of being disrupted:advances in innovative technologies such as blockchain are expected to transform the industryand its workforce by automating many of the activities currently performed by humans.The table below illustrates industries where interest in blockchain technology and its potentialtransformative benefits has been high, as demonstrated by significant investments from bothventure capital firms and large enterprises.

Financial services	Several stock exchanges around the world are piloting a blockchain platform that enables the issuance and transfer of private securities. Additionally, multiple groupsof banks are considering use cases for trade finance, cross-border payments, and other banking processes.
Consumer and industrial products	Companies in the consumer and industrial industries are exploring the use of blockchain to digitize and track the origins and history of transactions in variouscommodities.
Life sciences and healthcare	Healthcare organizations are exploring the use of blockchain to secure the integrityof electronic medical records, medical billing, claims, and other records.
Public sector	Governments are exploring blockchain to support asset registries such as land andcorporate shares.
Energy and resources	Ethereum is being used to establish smart-grid technology that would allow forsurplus energy to be used as tradable digital assets among consumers.

Since all businesses track information and face the challenge of reconciling data with counter parties, blockchain technology has the potential to be relevant to everyone. The first majoradoptions, however, may transform business processes and old legacy systems that are cumber some to maintain.

3.BLOCKCHAIN IN BUSINESS [1][7]

3.1 mobile

Will there be mobile blockchain in the future? Is it possible to run a blockchain on a smartphone. A smartphone is a small computer which is handy for being accessible and updated. However, a blockchain demands for much computing power, which a smart phone does not have, making it unviable to run a blockchain on a smartphone. Even if there are smartphones created with more computing power blockchain will still ingest the battery of the smartphone fast since blockchains are frequently updated. It is improbable that a mobile blockchain will become feasible in the near future.

3.2 Internet of things

When things are connected with other via internet it is referred as IoT (internet on things) wherein thing is a device having a on /off switch. Take for example the inhouse-regulation for lamps. It is possible to turn on/off the lights in a house with a smartphone. In this case, the smartphone is connected to the inhouse-regulation device. A different example is the meters in the Dikes which continually pass along the height of the water. We should keep in mind that blockchain is about value transferring so how to connect it? IoT works with a centralized model at the moment. The number of devices will grow rapidly, generating many transactions and increasing computational requirements. Other bottlenecks for IoT will be the servers that can no longer take data traffic from compromised devices. The nodes in a centralized model are less connected to each other than in a blockchain model where every node is connected. Blockchain technology will enable the creation of secure mesh networks. Every node of the network is registered on the blockchain, devices can identify and authenticate each other without the need of any human. This blockchain-network can also cope with many devices without being slowed down. Such a blockchain is used within enterprises to change their centralized models. These chains will be private permissioned blockchains. However, device identification and intercommunication are secured by a permission less blockchain that holds the unique identity of each participating node in the network.

3.3 Supply chain management

Blockchain technology and SCM can be pooled well. SCM faces the problem that the supply chain is not transparent. Supply chains are networks that exist of many stages and many geographical locations. This makes it hard to trace events and investigate incidents. For customers, this means that they cannot verify or validate the true value of the products and services. This results in an inaccurate reflection of the costs of production. Blockchain enhances the transparency and security of SCM. In the distributed ledger we can implement a simple application such as registering the transfer of goods on the ledger that would identify the parties involved. Other features that can be included are the date, price, quality, and state of the product and location. Blockchain technology makes it easier to trace back the events in the past. Accountability and security will no longer be a problem. This change in SCM will lead to dynamic demand chains in place of rigid supply chains, resulting in more efficient resource use for all. This resolves of disclosure and accountability. Usually, one party in the supply chain updates the chain, and they have to inform every user of the supply chain, this takes much time and is error prone. Many supply chains have to be updated often. In a blockchain, this can be done faster and without any mistakes. It seems like permissioned public blockchains are going to rule SCM in the future. These chains are regulated by the companies but distributed at large scale.

3.4 Housing market

Blockchain can be utilized for things which have monetary value or cost involved one such thing is house. House has a monetary value and we incur cost to purchase or sell it .Blockchain can act as broker thus reducing

brokerage cost which tends to be very high.For this to work, a platform should be created where home owners can put their houses for sale in a smart contract, if the buyer meets all the agreements of 26 the smart contract, the owning rights to the house will directly be transferred. Everybody who wants to buy/sell a house should be permitted to have a copy of the blockchain, so this is a public chain. This blockchain must also be a permissioned blockchain. If this chain would be a permissionless chain, anonymous buyers and sellers can exchange houses, and nobody will know to whom the houses belong (except for the owner). The government will not accept this, and therefore this chain should be permissioned.

3.5 Perishability

Perishable products are not a part of blockchains yet. When we take a look at the Bitcoin blockchain, there is a base transaction wherein new coins enter the system but there is no "empty" or "remove" transaction. For Bitcoin, removal of bitcoins from the system is not required so let us say that we will develop a public permission less blockchain for music rights. Government has a right to keep date of expiry. Music rights should be governed by government and only they shall remove it as soon as they expire. In a public permission less blockchain, this is not possible since the users are protected from changes by the developers of the chain. In a permission less blockchain, there cannot be one entity with the power to remove value out of the chain. For perishable products to work, we need to use a permissioned blockchain in which we approved that the authority to remove rights after their expiry. This will likely slow down the transaction process as not every user can validate the blocks anymore. The same concept can be applied to currency as well. If we think of making a blockchain currency legal, we need a governing body (Government of Country) who can freeze assets of criminals. It has similar impact on chain as we have for perishable products. So if there is going to be a blockchain currency nationally or internationally accepted, there will likely be rules and therefore this must be a permissioned blockchain. blockchain currency without permission is by default stopped.

3.6 Sports

Block chain has its utility in sports too. For instance smart contracts can replace existing system of contracts between player and club therein cutting role of negotiators and making smart contracts to do the same. Agents of players with a big network are redundant as the ledger is distributed between all clubs. In an ideal world, tickets for seats in the stadiums can be placed into a permission less blockchain. However, there are some lawbreakers who have a stadium ban and should be checked for. Therefore, the blockchain cannot be anonymous. All of these examples are public blockchains, these chains are used to pool resources and should be distributed between the collaborating parties. 5.7 Law Blockchains are becoming more and more relevant in business. Smart contracts will develop quickly which is going to result in different expectations due to misunderstanding. There should be rules assigned what to include in smart contracts. There should be contractual facts, for instance, a soccer player can be bought by clubs on the market if they pay enough money. There should also be human preference embedded; a soccer player should get a say in where he wants to play. If the player does not want to play in the Netherlands, then clubs in the Netherlands should not be able to execute this smart contract. As we know little of civil rights and commitment law, we want to impose on other researchers who do have the knowledge to investigate this matter further. There is no double checking in a smart contract, when the agreements are met, the contract is automatically enforced. Further research should investigate the contents of smart contracts.

3.7 Blockchain for Public Services [7]

3.7.1 Taxation

According to [8] PWC, UK, report Blockchain can make a big difference in improvising taxation. The report relates the key attributes of blockchain namely provenance, transparency and traceability to the exact needs of a

modern taxation system. A huge advantage of cutting on administrative cost can result from the use of blockchain especially in transaction taxes such as VAT, withholding Tax, stamp duties, etc. In a sharing economy, blockchain could be used to achieve compliance and transparency for tax payments, thus shifting the responsibility of collecting tax from tax authorities to participants of the sharing economy. In countries like India which are moving towards uniform taxation via GST (Goods and Services Tax), blockchain can help in tracking the end-to-end collection and expenditure of taxes by the government. While the tax provenance aspect is very important and so also is the utilization of tax earnings. The biggest challenge however, in this would be to achieve digitization of currently non-digital sellers who rely on paper records rather than digital ones. Pilots in this area in various countries are likely to be seen in future.

3.7.2 Healthcare

Over the former decade, we have witnessed tremendous growth in digitization of healthcare sector. Doctors , clinics and hospitals are digitizing medical reports (history) of patients which in turn facilitates easy retrieval , sharing and adding data for better diagnosis and decision making based on historical cases which is very vital for legal purpose.. However, medical data digitization also exposes it to a bigger risk of patient privacy violation. A blockchain based Healthcare Data Gateway (HDG) is proposed by Yue et al. [11] They propose the use of a private blockchain cloud to guarantee that the medical data cannot be changed by anybody including the patient himself and/or the physicians. Medical data is diverse in kind, i.e. it could be numeric, textual, image data (scans, x-rays, photos, etc.), video data (transcripts, recordings, etc.), etc. To remove the complexity of storing varied data types Yue et al. [11] propose an Indicator Centric Schema (ICS) based data model. In this model, a single table shall be used to organize all data for a given patient and would include simple relevant fields like timestamp, indicator, type, value and category. The ICS also can be extended to include a Purpose Centric Access Control model which would include say requestor, indicator, timestamp, purpose and retention duration. Such a model is extensible for use in other similar applications of blockchains where data of different types needs to be stored. A segregation of frequent and infrequently accessed data into separate blocks of the also be done. Xia et al. [12] have also proposed a blockchain based system MeD Share, for sharing medical data among cloud service providers. MeD Share would provide data access control, provenance and auditing. The proposed system also used smart contracts for data behavior detection from data access patterns, and blocks malicious users.

3.7.3 Voting

In the year 2014, a Danish political party was the first to use blockchain technology for voting [13]. Online voting platforms such as ‘Follow my vote’ [14], which enable digitally secure blockchain based voting have also been created.

3.7.4 Insurance

Cognizant Technology Solutions give an end-to-end view of how blockchain can transform insurance in their perspectives [15]. Travel insurance, crop insurance, property and casualty insurance and most importantly health insurance are all set to change with the use of blockchain technology. A multiparty shared network with insurers, hospitals, funeral homes, a department of health and the beneficiary forming the nodes of the blockchain, can be created. This setup will provide the necessary disintermediation and speed required for the insurance and claim process to be streamlined and to eliminate frauds.

3.7.5 Smart Cities

A possible application of Blockchain to smart cities is suggested by Sun et al. in [16]. Authors relate a smart city to a sharing economy where information and communication technologies are utilized to improvechances of

sharing of resources. Author suggests that using a blockchain based framework for sharing of resources across numerous services to ensure data immutability, accountability, proper asset utilization and to reduce transaction costs.

4.BLOCKCHAIN CHALLENGES [7]

Regulation is the biggest challenge for non-fiat currency from viewpoint of governance as compared to end user. The rate of technical innovation is exceeding the rate at which regulations catch up. The currency advancement has seen a transformation in the order from fiat currency to e-money to virtual currency to cryptocurrency [9]. Cryptocurrency is the first decentralized version of currency. Some regulatory bodies hold the opinion that cryptocurrency does no fulfill the functions of money primarily due to its value volatility. [17]

Reports regarding use of bitcoin in illegal activities, drug rackets, money laundering, etc has started to flare. Trevor Kiviat [10] highlights the difference between at currency and cryptocurrency and the challenges associated with cryptocurrencies regulation. IRS of USA have framed laws for taxation of Bitcoin holdings while Russia is considering banning Bitcoin due to the usage of this unregulated currency for unethical purposes. China also has banned Bitcoins while Australia has passed a resolution to accept Bitcoin transactions. [18, 19]

The Economist (2015) article - The magic of mining [20] highlights a very important challenge of power consumption associated with mining and provides with some examples of how increasing power is being invested in mining activities to earn Bitcoins.

Bitcoin's growing acceptance has led to worries about the ability of the core blockchain technology to scale. Since Bitcoin is a self-regulating system that works by discovering blocks at approximate intervals, its largest transaction throughput is effectively capped at maximum block size, divided by the interval [21].

In their paper, Wei Xin et al. propose various strategies to improve private blockchain scalability. The have recommended and experimentally shown that optimization of parameters like block construction, block size, time control and transaction security can lead to better performance and lower error rates.

In the light of the fact that several international electronic primary financial exchanges have begun to announce they will explore the adoption of blockchain technology in their trade processing and reporting for execution and clearing, Peters and Vishnia [22] examine the current status of regulatory requirements and the challenges faced by market participants in meeting them.

An interesting tradeoff is revealed by the work by Rimba et al. [23] on cost of storage and computation of business processes on a standard cloud environment vs. blockchain environment.

As per the results of this experiment costs of a single business process (Incident Management) were higher on Ethereum blockchain than on Amazon SWF. However, the experiment is done for a limited scope of a single business process and the results may not be generalizable, given the day to day advances in blockchain technology towards its optimization.

One key limitation of Blockchain technology is the scalability issue due to size of the public or permission less blockchain. Blockchain optimization and scalability is an area of much research. In [24], Gencer et al. propose a service oriented sharding technique to achieve blockchain scalability and extensibility.

5. CONCLUSION

Trust on blockchain technology is increasing, thanks to its abundant application and experiments. Scalability and consensus algorithms are considered to be areas of growing research so as to make blockchain more adaptable for

large scale business. Future research areas are taxation, education, insurance which are yet to adopt blockchain .. Acceptance of cryptocurrency by governments and establishment of regulations governing them are very important to ensure ethical use of cryptocurrency. The public blockchains also provide an opportunity of mining interesting patterns of cryptocurrency usage, user behaviors and monetary networks across the globe.

The Blockchain has been especially recognized to be appropriate in developing nations where guaranteeing trust is of a major worry. Thus the innovation of the Blockchain can be perceived to be a vital and much needed additional component of the Internet that was lacking in security and trust before it would be of interest to explore blockchain technology's contribution within real world use cases. Hence, insights are to be generated by performing a large-scale empirical analysis on existing areas of application.

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