BlockChain Technology

Centralised Ledger to Distributed Ledger

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Abstract - *This paper talks about block chain technology and its working principle. The paper is drafted to create an understanding of the blockchain technology and how it is different from the currently used centralized transactions systems. The paper also describes the advantages of block chain and various evaluation techniques.*

Key Words: **Block chain technology , Bit Coin , Block Chain Evaluation , Fintech , Distibuted Ledger , Centralized Ledger.**

1. INTRODUCTION

A blockchain is defined as a public space including all Bitcoin transactions that have been made until the current transaction or the last transaction. As finished blocks are enclosed to it as and when the transactions are complete, the blockchain is becoming bigger and bigger. These blocks are coming into the blockchain following a chronological order, in a linear way. The computers which are part of the Bitcoin network are called nodes. All of these nodes receive a copy of the blockchain, this taking place automatically when a client joins the Bitcoin network. There is a lot of information included in the blockchain, for example the addresses and their balances from the beginning until the newest completed block.

1.1 Current state of transactional ledgers

Accounting system and its digitalisation have not yet attained maturity compared to other industries .Few reasons may be due the very high involvement of regulators. The accounting details of an organisation must meet all regulatory requirements in order to retain the validity and integrity of all transactions. Organisation needs to be very careful in developing new ledger systems to ensure very high security and prevent any fraudulent activities. In order to achieve this, many transaction are still manually processed and verified, which has affected the day to day operations. Most of these manual tasks are not automated at all and doesn't seem to be automated in the near future so as to maintain the integrity and validity of transactions [1].

Most of the organisations uses a Centralised ledger system to record all day to day transactions. A centralised ledger system is a compilation of all transactions which is controlled by a single entity i.e. it has a single point of control. For example : In – case of bank transactions which are posted on a centralised system if the controlling entity shuts down abruptly , all transactions will be terminated and cannot be processed. This can lead to miss-representation of transactions in the bank statement [2]. This will affect all of the bank's clients. Also, if the bank has any intentions of forgery, they can take away all the money and can cause serious financial impact to all its clients. In centralized ledger system internal and external reconciliation of data is required to ensure the integrity of transactions. The centralized system provides no restrictions on the operations which can be performed in the ledger. For example: Any user can modify a transaction and back date them. This can lead is misstatement of financial transactions and fraudulent activities. To avoid such transactional errors a decentralized system or a distributed ledger can be introduced [3].

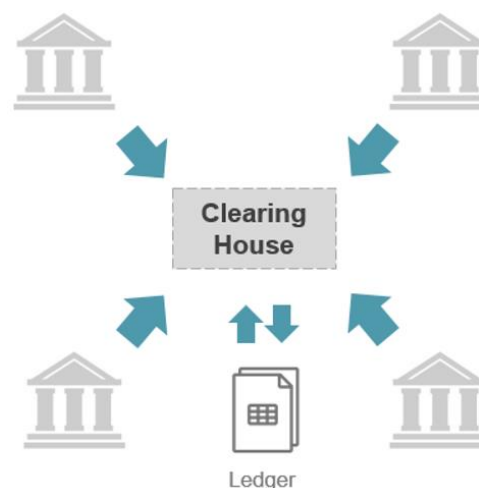The diagram below shows the workflow of a centralized system:

Fig.1 Centralized Systems

2. Distributed Ledger and BlockChain

A distributed ledger which is also known as a shared ledger is a list of shared and synchronized data which are geographically spread across multiple sites. The data is exactly replicated and synchronized across all locations to maintain data integrity, availability and resiliency [4]. Unlike the centralized system, there is no central administrator or single point of control. If a location abruptly fails or stop functioning the remaining location has the data and capacity to maintain the ledger or all transaction details in the absence of the failed location. This way a distributed ledger provides real-time information and reduced error or fail rates of transactions. This also reduces the costs of infrastructure as compared to the centralised system. A distributed ledger uses a peer-to-peer network to communicate with nodes which are spread around the globe. Additionally, distributed ledger technology give us the opportunity for economies of scale achieved by allowing the transaction to serve simultaneously as agreement, settlement, and regulatory reporting. Instead of building numerous duplicative and redundant services, one master prime record can serve as the source, eliminating the need for reconciliation and increased post-trade processing speed [5]. The diagram below shows the workflow of a centralized system:
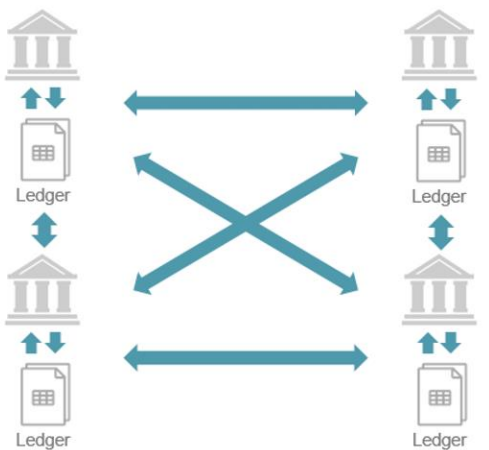

Fig.2 Centralized Systems

In short, the major differences of a centralised and distributed are:

Distributed Ledger	Centralized Database
Consensus on data	Internal and external reconciliation required
Append-only (Immutable)	No restrictions
Distributed	Single point of failure
Decentralized	Single point of control
Peer-to-peer	Unnecessary gateways and middlemen
Cryptographic verification	Cryptography must be added as afterthought
Cryptographic authentication and authorization	Actions are done on behalf of others
Resiliency and availability increase with node count	Backups must be set up 'manually'

A distributed ledger system can be implemented using a blockchain system. Block chain technology represents the next step for accounting. It is a distributed system. The blockchain is mainly the most important invention of Bitcoin in terms of technology, and it is a tremendous proof for every transaction completed within this network [6].

3. How does Blockchain work?

The block is an actual part of a blockchain and this stores the latest transactions. When these are finished, they will be a permanent part of this database. After a block has been completed, a new one will emerge, so that there are already a lot of blocks in the blockchain. Some people might question if the blocks are put in the blockchain in a random manner. The answer is that they're properly arranged in a linear way, which is in a chronological order, and each block includes something from the previous block. This is where the name of this technology comes from, they are linked like a chain [7].

There is a Bitcoin protocol which stipulates that each node which takes part in this system has access to the database. An entire copy of the blockchain will contain reports on each Bitcoin transaction that was made. Relevant information can be found, such as accurate details about a certain value which belonged to an exact address some time in the past [8].

What is considered to be a future problem is the fact that the blockchain is permanently growing. There might be issues with synchronization or storage because once in 10 minutes a new block is added to this increasing blockchain. The blockchain includes a lot of digitally recorded data in sets or packages named blocks. With the data stored within the network, the blockchain helps removing the risks which occur when data are stored centrally. Decentralised blockchain make use of the so-called message passing and also of types of distributed networking. In this case there are no vulnerable points which hackers might take advantage of. For the security of the blockchain there is a public key

cryptography, which is a kind of address of the blockchain, including lots of numbers generated at random. Then bitcoins which are sent in the network are considered to be from that specific address. A private key has the role of a password, offering access to the digital records only to the owner. The data that are added to the blockchain is considered to be safely stored.

As explained before, each node in a type of decentralized system owns a copy of this blockchain. Special characteristics, such as data quality, are maintained due to operations called replication and computational trust. Thus, all transactions are sent to the network by means of software, the nodes will validate the recent transactions and then these will be appended to the block. Then a new block is created, and after that the completed block is broadcast to other nodes as well. Also, certain time-stamping methods are generally used, and also proof-of-stake and proof-of-burn. The only problem is that a decentralized blockchain is rapidly growing and there is always the risk of node centralization, since computer pieces necessary to perform big data operation are more and more expensive [9].

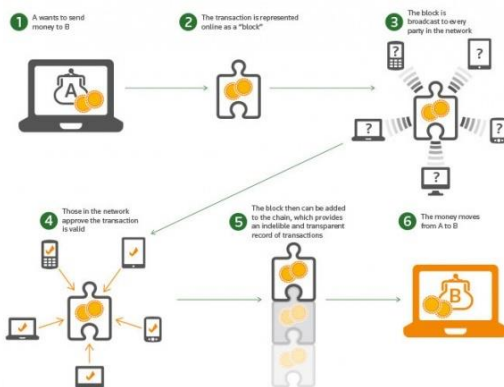The diagram below show the working of blockchain.

Fig.3 – Working of BlockChain

4. Evaluating a blockchain solution

 The blockchain model is a revolutionary tool for businesses, and it can be particularly useful for cross-border payments, trade arrangements, remittances. This can also allow different new business opportunities, for example smart contracts and in case of insurance claims.

Although it is a new technology, blockchain is rapidly advancing and growing. There are a number of main issues which organizations need to assess and check the technology from both a technical and a general business point of view.

Regulatory and compliance implications
Following the financial crisis which started in 2008, governments in the majority of the countries have taken measures in order to check and measure the activity of financial institutions and to ensure safety for transactions, in order to prevent future trouble. Also governments are very much attentive to every innovation or modification in this industry. Probably new innovations in the financial and banking sector will be thoroughly scrutinized and checked, and also will need to cope with tough regulations.

Data Privacy
Blockchain has many levels of security, and one of these is the immutability of data. Thus, no change can be done to the data after it is validated and included in this block. Moreover, the data will remain there for as long as the system is valid. Since blocks are sent across the network and are open for all the participants to check, it is important to take into consideration some aspects like concerns regarding privacy of the data which is included there. Some of the clients may want to know if personal identification can be revealed or if data is encrypted.

Operational concerns
Similarly to a production system, a solution which is offered by blockchain must have an operational side to it. This solution needs to be integrated and this depends also on the respective institution's applications. Thus, there might be technological and business issues, and maybe the staff will necessitate training. Also, such problems as capacity planning, business continuity may arise and will need to be addressed.

Data Standards
As already mentioned, different types of data are included in this blockchain. Solutions are rapidly expanding and so blockchain technology will be useful for other areas. At present, these solutions are utilized within open networks, for example Bitcoin. On the other hand, there are private networks, where each participant can be known by another one. Of course, there are specific regulations in both of these cases which the participants need to respect. These must refer to structure, formatting, and taxonomy of the stored information. These regulations are called standards and they are defined, clearly communicated and then enforced to be followed within the entire network structure.

Data analytics and insights
The blockchain is growing rapidly and so organizations may need methods to search history and use it, which is analytics and business intelligence for blockchain. Without such an

analysis, important data might be lost and thus return on investment can be reduced as a consequence.

Network governance

As mentioned, Blockchain represents a business type of decentralized solution having no authority. There may emerge the need for a governing structure, mainly for those types of blockchain solutions which are used by financial institutions. This would need to be implemented for offering and maintaining a certain set of rules regarding the onboarding, participation, problems which may arise, and others. Each participant needs to obey the network regulations, how they are maintained, established and then enforced.

Scalability

Bitcoin and Ethereum are one of the most popular organizations that implemented blockchain solutions, relying on various validation speeds. For example, a block is verified by Bitcoin in 10 minutes and recorded data will be confirmed after a number of 6 validations. Thus, in as much as 60 minutes there will be cryptographic proof that attest the funds were transferred in a securely manner. The same operation takes place only in 17 seconds in Ethereum. So, there is a bit of a difference in speed. There are cases, such as payments between banks and high-volume operations, when this speed might not be satisfactory. Therefore, organizations will use various blockchain solutions, depending on their specific needs.

Security

It certainly is very important to have the digital values secured, if you take into consideration the possibility of using blockchain technology and other cryptocurrency, such as Bitcoin. These digital funds have a public key and this private key is kept in a kind of digital wallets which have protection, called passphrase. It might be correct to say that a digital wallet is similar to an account. There are many various forms for all kinds of available devices.

5. BLOCK CHAIN IN FINANCIAL SERVICES

Blockchain is considered to be the most fascinating invention since the Internet. In a few words, this technology enables people to perform transactions in a fully transparent way. No one mediates this transaction and therefore this entire technology makes things easier and much cheaper. It is in fact a powerful concept which can operate within the whole area of the digital world, enabling any type of transactions to be securely made. There are numerous companies that began to use this accessible blockchain technology [13]. The entire network is made up of nodes that is distributed

servers. The nodes receive and process the transactions, and share the information further on. Thus, the business models are much more accessible to understand and seem quite impressive.These transactions which are recorded will permanently remain there. The entire network of computers which have Bitcoin software is responsible for the performance and the overall maintenance of the chain. In an entire hour, a number of approximately six blocks are created, and appended to the chain, and then transmitted to the nodes. The Bitcoin software will notice quite quickly when a Bitcoin amount has already been spent.This last feature is a lot utilized by organizations such as banks, developers, entrepreneurs. Among them, there is Santander Bank, which is in top 10 largest banks. They have also researched this technology and communicated that their team is working in order to find solutions to apply this innovation. International banks which are also interested in blockchain are Citi and JPMorgan. A lot of the startups start their business taking into consideration this technology. Companies like KPCB manifested their interest for an investment in these types of startups. There are startups such as Coinometrics that collect information and research regarding the qualitative and quantitative data about blockchains. BTCJam offers loans based on bitcoins. The following startups have also been built around blockchain technology: BlockCypher, BitPay and BitPagos [14].

Chain is another company which makes financial products based on blockchain technology with a Bitcoin named API. NASDAQ picked Chain to conduct a pilot project based on the blockchain technology, about the NASDAQ Private Market.

Since there are so many applications of the blockchain technology, it might happen to bring trouble within the FinTech industry in the near future.

All kinds of financial institutions are interested more and more in the blockchain technology and only Santander Bank has found around 25 cases to be used with this technology. This bank made an ample research and found that using blockchain by banks might reduce costs in infrastructure by up to $20 billion a year. UBS Bank have organized a research lab around blockchain in London. Goldman Sachs developed an investment in Circle, which is a Bitcoin startup. Also, NASDAQ does thorough research regarding this technology.

This technology is most important because it allows people to perform transactions even if they're strangers, but in a fully transparent way. No mediator exists between the two entities of a transaction and in this way the whole process is performed not only easier, but also cheaper. This type of concept can be used in digital applications in the world, making transactions and exchanges secure.

6. Conclusion

From the study above, we would like to conclude that Blockchain can be used to manage data from multiple location retaining its authenticity and integrity. BlockChain helps by removing the involvement of third parties in any transaction.It can be implemented in the financial sector to avoid fraudulent activities.

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