Adoption of Blockchain in Financial Services.

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ABSTRACT

A blockchain is an ordered, decentralized and immutable ledger which allows a recording of transactions in a network. Over the years, it is projected that blockchain has emerged to be a technology that can be applied in various sectors. It can be said that these technology will allow the transactions to be simple, effective, safe, and cheap. The main aim of this research was to study the possible impacts of blockchain in Financial Services along with its challenges and limitations. The outcome would include a good explanation of blockchain technology, how it works, future implementation of this technology in financial services and its challenges.

Keyword: - *Blockchain, Decentralized, immutable ledger, etc….*

1. Introduction

A blockchain is a type of shared database which records the transactions permanently. A blockchain can also be called as "Distributed Ledger". The "blocks" in blockchain contain records of information such as-

■ transactions which may include the date, time, and amount of a purchase,

■ the digital signature of the buyer and seller of the transaction, and

■ a unique identifier (called as "hash"). Each block is linked to the previous block by the hash that verifies it has not been changed since it was created and sets its position in the chain. The "chain" in blockchain forms the link between all the blocks. Each time a new transaction occurs and it is added as a permanent block to the chain.

The main purpose of the blockchain is to establish trust (that a transaction has occurred and the amount has been paid) among untrusted parties (when you don't know the identity of the parties to a transaction). Prior to the blockchain, trusted third parties like banks, brokers, or big retail distributors, like Amazon, facilitate transactions between two parties who don't know each other. The intermediary plays a very important role as it helps to verify and check identities, which confirms that the transaction has actually occurred, and ensures that it was conducted for the amount that both parties agreed upon. The blockchain technology eliminates the need for such centralized authorities because it contains all the data about the transaction and data can be viewed by, all the parties.

To sum up, the blockchain is distributed among all number of participants in a network and not under the control of a single participant. Any changes made to the data are updated to all participants. Blockchain is different from a traditional database because of the way it creates trust among the parties. It should be ensured that blockchain is

designed and implemented correctly; the blockchain also ensures that both the data and the network are resilient as it cannot be tampered with. This is because if there is any attempt to manipulate a prior transaction it requires a reprocessing of all the following blocks in the chain. This reprocessing would need to outpace the rate at which new blocks are added to the chain. As a result, many view the blockchain as immutable or immune to manipulation.

1.1 Blockchain Architecture:

Blockchain can be defined as a chain of blocks. Each 'block' acts as a file that stores unalterable data related to the network. The first block in the chain is known as "**Genesis block"**. Each new block in the chain is linked to the previous block and thus form the chain.

Image 3: Blockchain Representation

Each Block consists of:-

1. Data
2. Hash
3. Hash of the previous block

A "Hash" can be understood as a code same as fingerprint which is unique for each block. A "Hash" gives each block a unique identity. So once a block is created and if there is any change inside the block it will lead the hash to change. Therefore, the hash is very useful when you want to detect changes to the intersections.

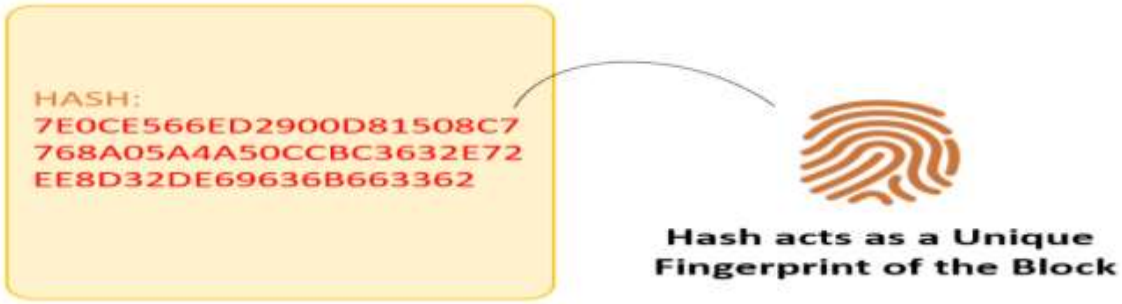

Image 4: Hash of Blockchain

Explanation:

Consider, we have a chain of 3 blocks. The 1st block has no predecessor. Thus, it does not contain hash of the previous block. Block 2 contains a hash of block 1. While block 3 contains Hash of block 2.

Image 5: Hash Code Allocation of Blocks

Thus, all block contains hash of previous blocks. This is the technique which makes a blockchain so secure.

Assume an attacker wants to change the data present in the Block 2. Correspondingly, the Hash of the Block also changes. But, still Block 3 contains the old Hash of the Block 2. The old hash which Block 2 holds makes Block 3, and all succeeding blocks invalid as they do not have correct hash the previous block.

Image 6: Manipulation of Data in Block

Therefore, changing a single block can quickly make all following blocks invalid.

Proof of Work

Hashes are said to be one of the best mechanism to prevent tempering but now-a-days computers are high-speed and can calculate hundreds of thousands of hashes per second. Within few minutes, an attacker can tamper with a block, and then recalculate all the hashes for other blocks to make the blockchain valid again.

To avoid the issue, blockchain use the concept called as Proof-of-Work. This mechanism will slow down the creation of the new blocks.

A proof-of-work is a computational problem which takes certain to effort to solve. However, the time required to verify the results of the computational problem is very less as compared to the effort it takes to solve the computational problem itself.

In case of Bitcoin, it takes almost 10 minutes to calculate the required proof-of-work to add a new block to the chain. Consider an example, if a hacker wants to change data in Block 2, he would need to perform proof of work (which will almost take 10 minutes) and only after 10 minutes he can make changes in Block 3 and all the succeeding blocks.

Image 7: Proof of Work: Ex- Bitcoin

This type of mechanism will create difficulty to tamper with the blocks and even if anyone tries to tamper with even a single block, they will need to recalculate the proof-of-work for all the following blocks. Therefore, hashing and proof-of-work mechanism will make a blockchain more secure.

Distributed P2P Network

There is one more method which is used by blockchain to secure themselves, and that is by being distributed. Instead of using a central entity to manage the chain, Blockchain use a distributed peer-peer network, and everyone is allowed to join. When someone newly wants to enter into this network, he will get the full copy of the blockchain. Each computer is called a node.

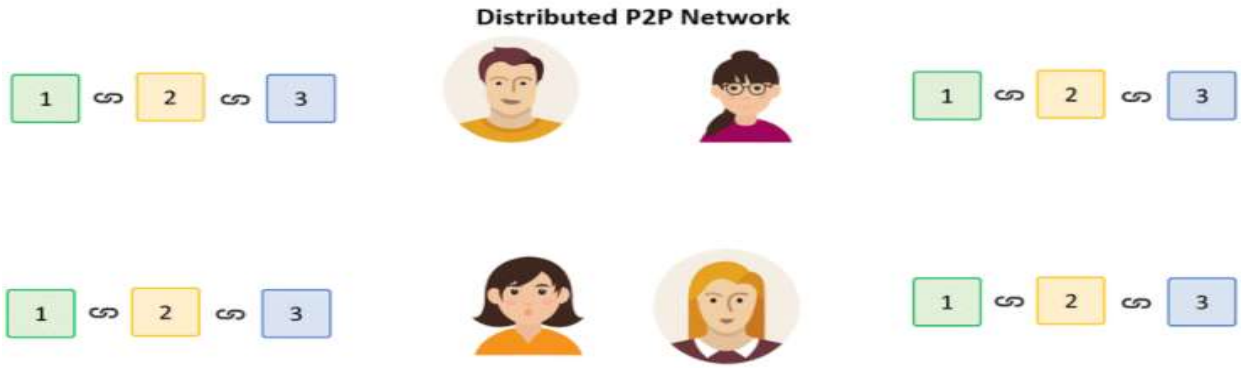

Image 8: Distributed P2P Network

Let us understand, what happens if any user creates a new block. This new block is sent to all the users who are within the network. Each node's role is to verify the block to ensure that it hasn't been manipulated. After complete verification, each node adds newly created block to their blockchain.

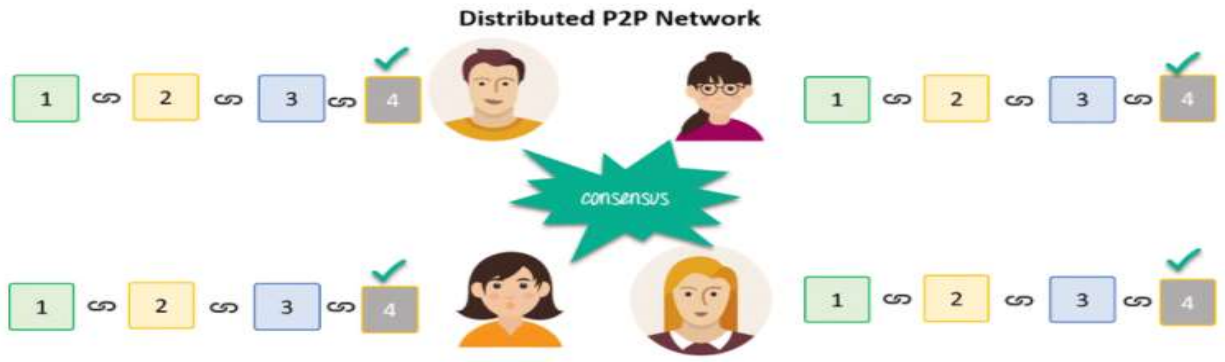

Image 9: Adding of new block to Blockchain

All these nodes in this network create a **consensus**. They agree on which blocks are valid and which are invalid. Nodes which are in the network will not accept those blocks that are tampered with.So, to successfully tamper with a blockchain

1. You will need to tamper with all blocks on the chain
2. Redo the proof-of-work for each block
3. Take control of greater than 50% of the peer-to-peer network.

After doing all these, your tampered block becomes accepted by everyone else. This is next to impossible task. Hence, Blockchain are so secure.

1.2 Literature Review

1. The Blockchain Report: Welcome to the Internet of Value (Bogart & Rice 2015)

According to Bogart & Rice, A Blockchain is a list of encrypted digital record or transaction, called a block. Each block is then linked to the next block, in a linear, chronological order, using a cryptographic signature. The blocks contain a copy of the last transactions since the last block was added. [1]

2. A Review of Blockchain Technology and its applications in the Business Environment (Greenspan, 2015a; Christidis and Devetsikiotis, 2016)

In this paper, Christidis, & Devetsikiotis explained that the shared block, or ledger, is linked to all participants who use their computers in a network to validate or confirm transactions, removing the need for a third party.

Also had highlighted that Blockchain introduced serious disruptions to the traditional business processes since the applications and transactions, which needed centralised architectures or trusted third parties to verify them, and now operate in a decentralised way with the same level of certainty. These inherent characteristics of blockchain architecture and design provide properties like transparency, robustness, auditability, and security. [2]

3. Bitcoin: A Peer-to-Peer Electronic Cash System (Nakamoto, 2008)

In this Paper, Satoshi Nakamoto, the unknown person/group behind Bitcoin, described how the blockchain technology, a distributed peer-to-peer linked-structure, could be used to solve the problem of maintaining the order of transactions and to avoid the double-spending problem. [3]

4. Blockchain Technology: Beyond Bitcoin (Crosby et al., 2016)

In this paper, Michael Crosby proposed that, Bitcoin orders transactions and groups them in a constrained-size structure named blocks sharing the same time stamp. The nodes of the network are called as miners who are responsible for linking the blocks to each other in chronological order, with every block containing the hash of the previous block to create a blockchain. [4]

5. The Generic Blockchain Ecosystem and its strategic Implications (Glaser & Bezzenberger 2015; Tapscott & Tapscott 2016; Swan 2015)

In this paper, Glaser & Bezzenberger; Tapscott & Tapscott proposed that, the Blockchain Technology possess following characteristics: a distributed ledger, decentralized data management, data security, transparency and integrity, anti-tampering and anti-forgery, high efficiency, low cost, programmable features that increase flexibility and reliability and no risk of a centralized database failure. [5]

2. Data Analysis

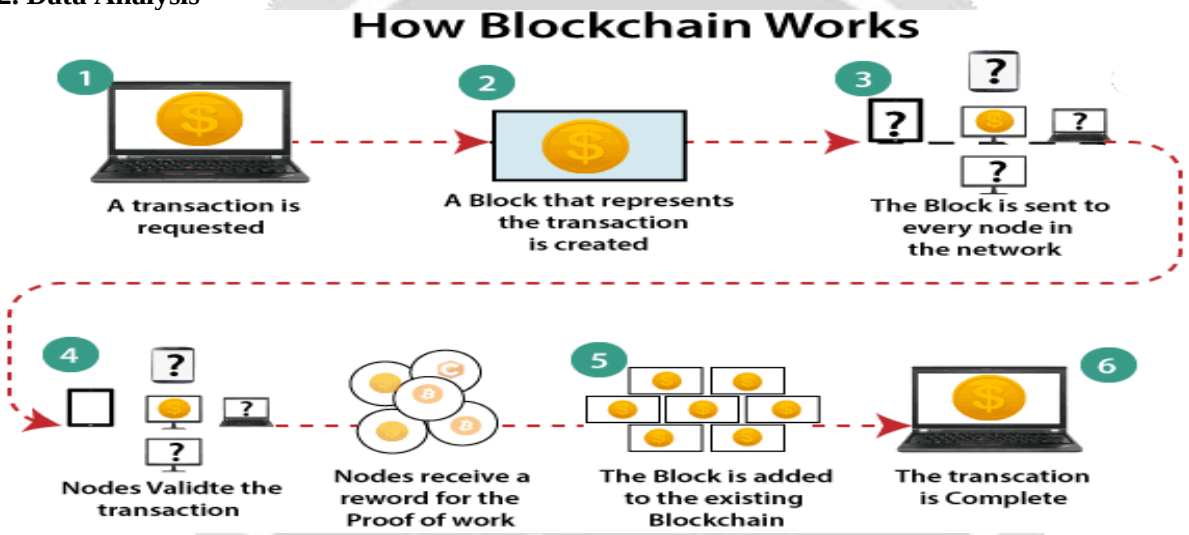

Fig -1: Working of Blockchain

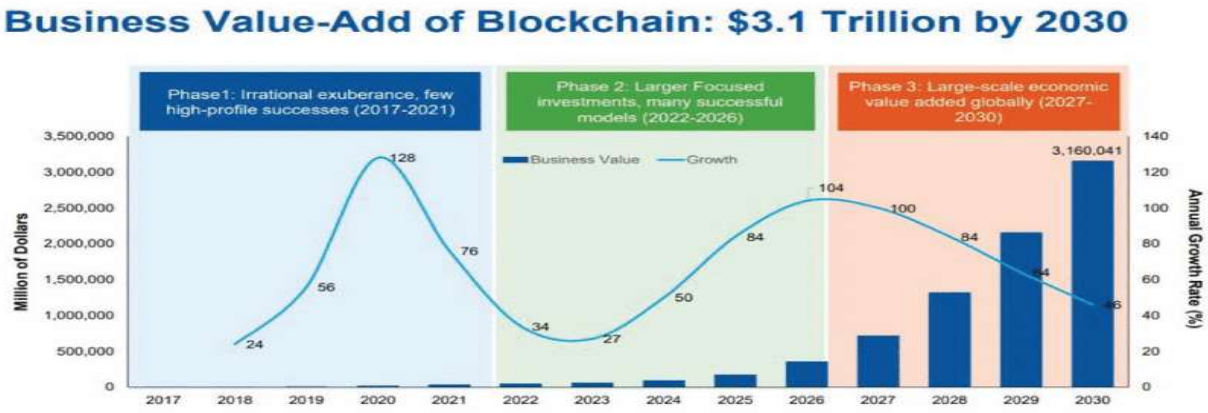

Fig -2: Blockchain Investment Growth Rate

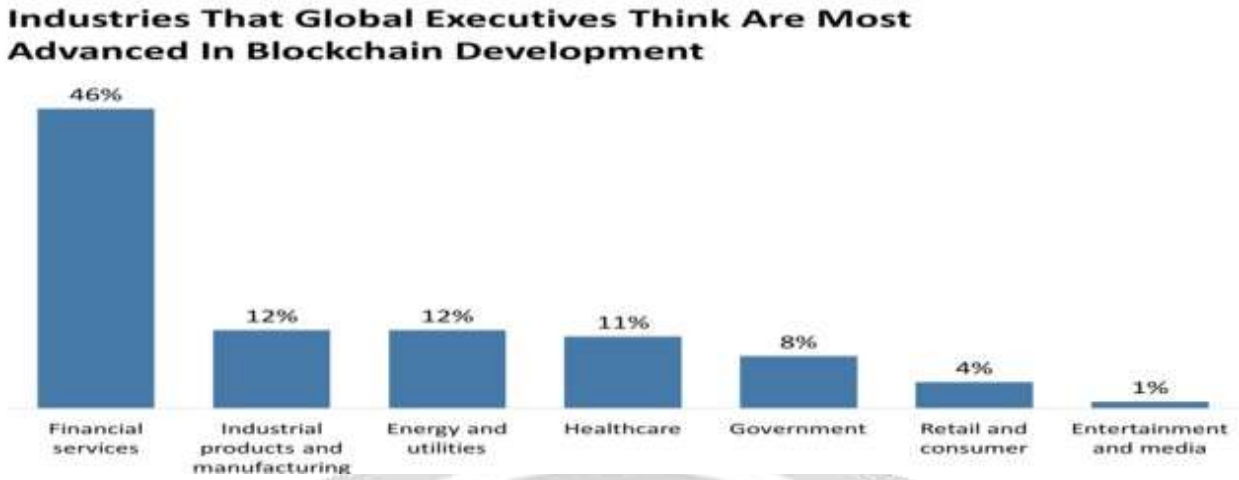

Fig -3: Areas of Blockchain

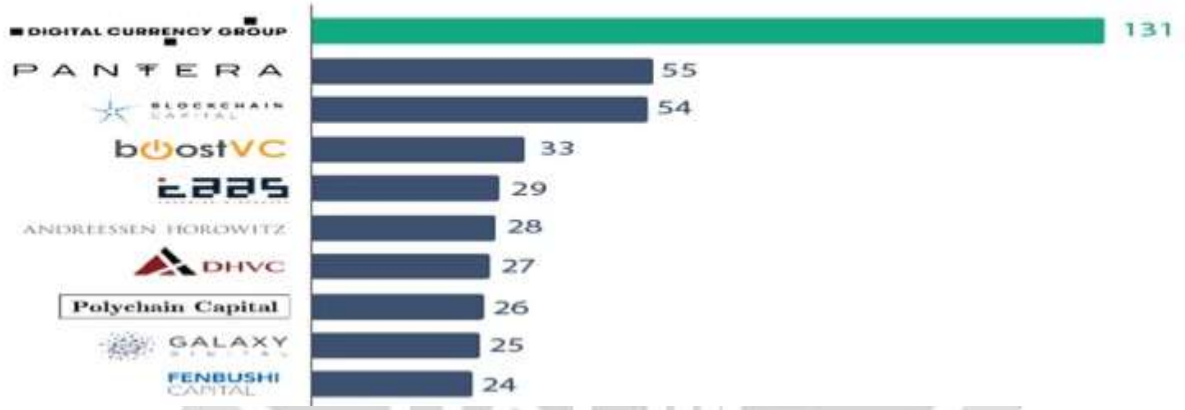

Fig -4: Active Investors in Blockchain

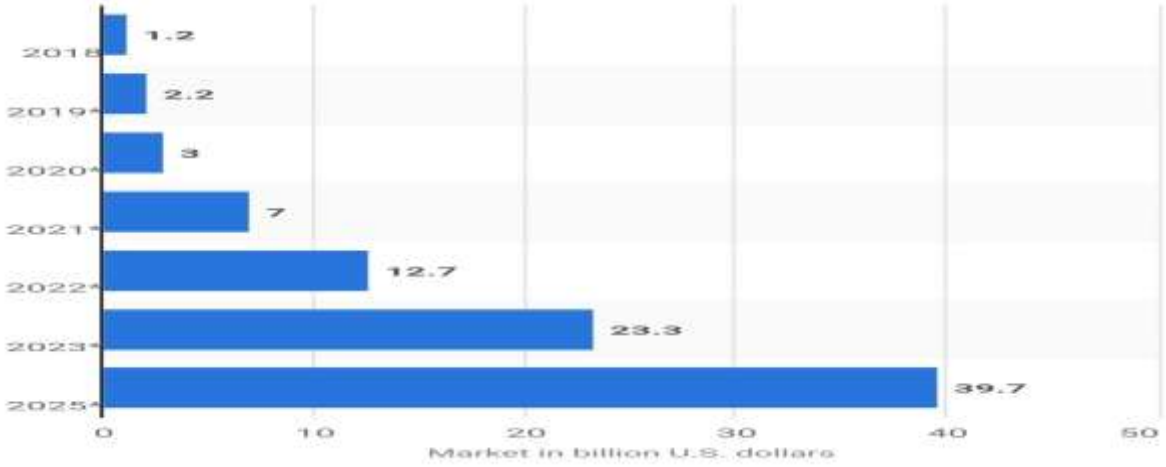

Fig -5: Future of Blockchain

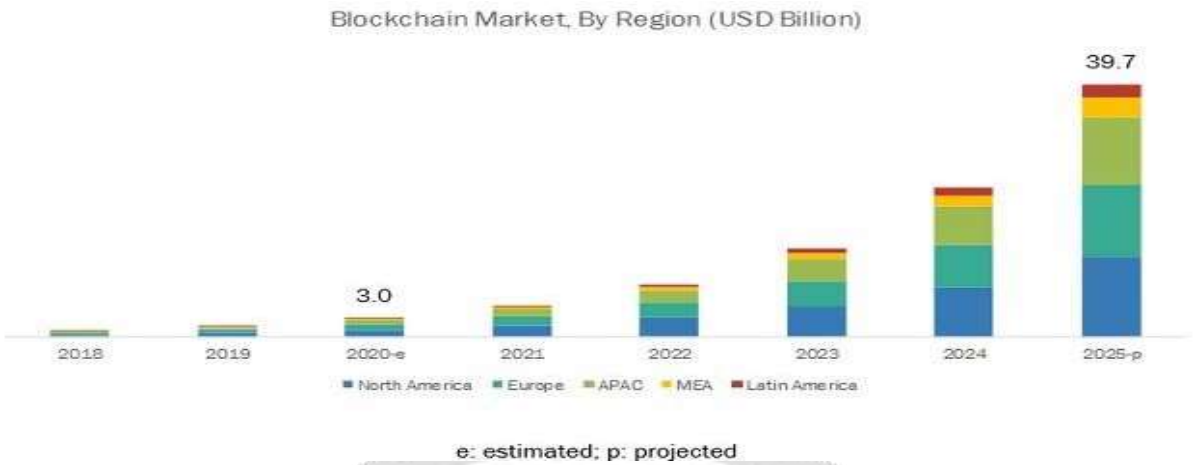

Fig -6: Area Tapped by Blockchain across the globe

2.1 Challenges and Opportunities of Blockchain Adoption in Financial Services

Table -1: Challenges of Blockchain Adoption in Financial Services

SR.NO	CHALLENGES	EXPLAINATION
01	Awareness and Understanding	The principal challenge associated with blockchain is a lack of awareness of the technology, especially in sectors other than banking, and a widespread lack of understanding of how it works. This is hampering investment and the exploration of ideas.
02	Culture	A blockchain represents a total shift away from the traditional ways of doing things – even for industries that have already seen significant transformation from digital technologies. It places trust and authority in a decentralised network rather than in a powerful central institution. And for most, this loss of control can be deeply unsettling.
03	Cost and efficiency	The speed and effectiveness with which blockchain networks can execute peer-to-peer transactions comes at a high aggregate cost, which is greater for some types of blockchain than others. This inefficiency arises because each node performs the same tasks, as every other node on its own copy of the data in an attempt to be the first to find a solution.

04	Regulation and governance	Regulations have always struggled to keep up with advances in technology. Centralized systems, particularly in financial services, also "act as shock absorbers in times of crisis" despite their challenges and bottlenecks. Decentralized networks can be much less resilient to shocks, which can impact participants directly, unless careful thought is given to their design. Thus, there is strong argument for blockchain applications to work within existing regulatory structures.
05	Privacy and Security	Information on Distributed ledger (DLs) is available to all of the network participants. In permission less ledger, counterparties may be able to explore transaction history including those transactions that they are not part of. Hence, privacy and security is the main challenge in front of organization while implementing Blockchain technology.

Table -2: Oppurtunities of Blockchain Adoption in Financial Services

SR.NO	OPPURTUNITIES	EXPLAINATION
01	Trade Finance	With the help of Blockchain in Trade Finance following things can be achieved- 1. Automation of Process. 2. Automatic Refreshment of Clauses. 3. Operational Security. 4. Reduce time and costs. 5. Expedited Deliveries. 6. Unnecessary Intermediaries.
02	Global Payments	If Blockchain is used in Global Payments, it can give following benefits- 1. Track full transaction history. 2. Define the role of all parties involved. 3. Reduced Operational costs. 4. High Security processing. 5. Faster execution of transactions. 6. Greater Clarity and Transparency.
03	Capital Market	In capital market, Blockchain will be used for following purpose-

		1. Speeding up and ease the execution of contracts. 2. Reduced Counterparty risk. 3. Higher efficiency and transparency. 4. Conceptual change in issuance, clearing, settlement and reporting. 5. More efficient investment management and data storage.
04	Insurance	Role of Blockchain in Insurance are as fallows- 1. Lightening of procedures. 2. Use of smart assets. 3. Faster movement of the claims. 4. Elimination of intermediaries. 5. Minimization of insurance fraud Automated payment.
05	Regulations and Compliance	Block chain's opportunity in regulation and compliance area- 1. Providing up-to-date and reliable information. 2. Easy tracking of origin of funds. 3. Minimize manual processing and analysis of information.

2.2Use of Blockchain in Financial System

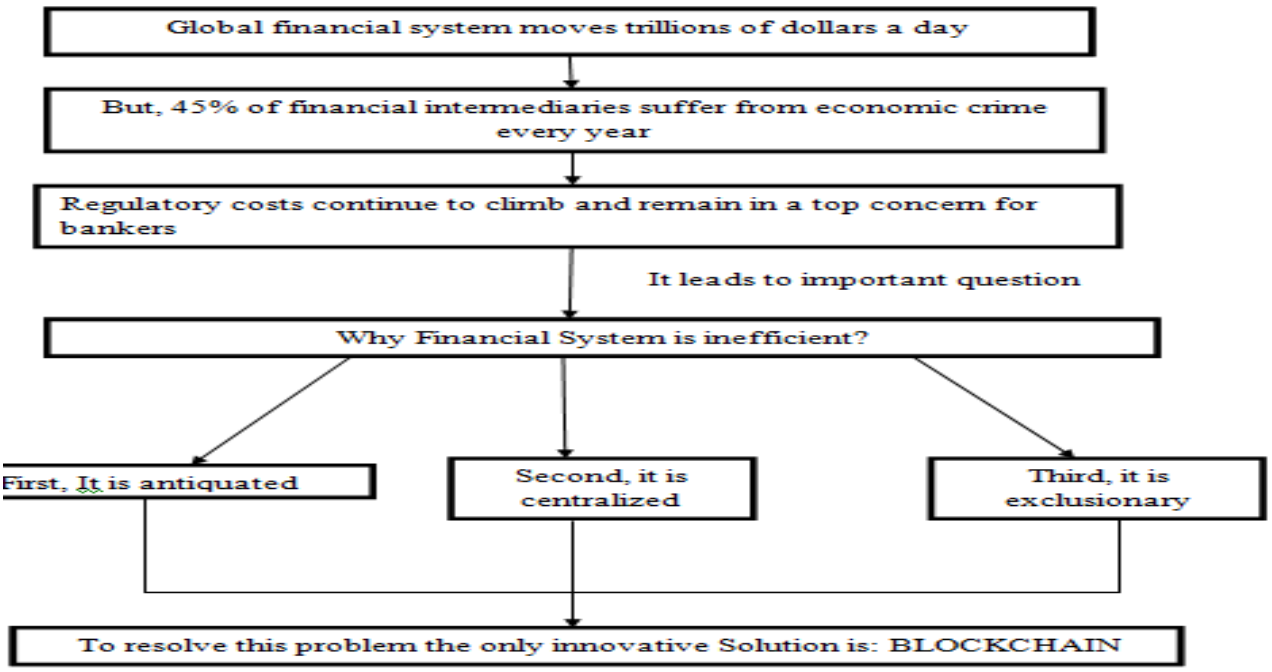

Fig -7: Preblockchain Scenario

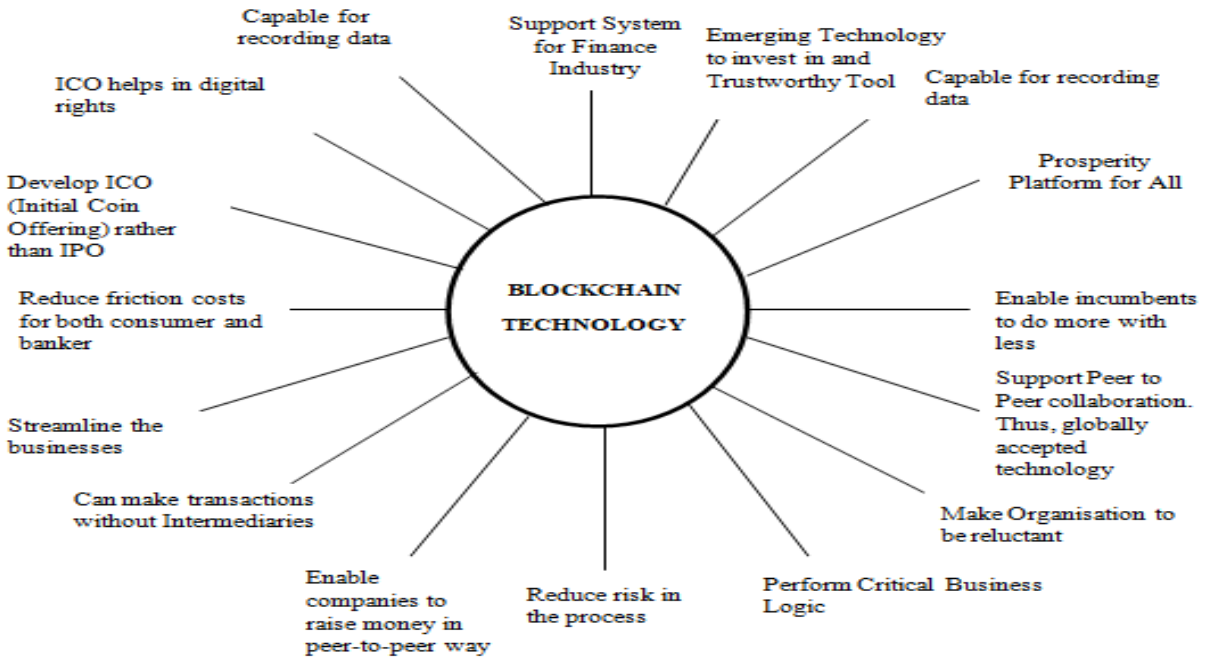

Fig -7: Postblockchain Scenario

3. FINDINGS FROM DATA ANALYSIS:

According to Statista,

1. In 2020, global spending on blockchain solutions is projected to reach 4.1 billion dollars. Spending growth on blockchain solutions will be compromised due to the corona virus outbreak, but will still remain quite high –the projected 2020 spending is more than 50% higher that from the previous year. Forecast suggests that spending on blockchain solutions will continue to grow in upcoming areas, reaching over almost 18 billion U.S. dollars by 2024.

2. The distribution of global blockchain market revenue in 2020, by industry is "Banking" with the largest blockchain spending, with a market share of almost 30%.

3. World Wide Spending on blockchain solutions 2020 is 4.1bn USD.

4. Sector with the highest distribution of blockchain market value is Banking.

5. Equity Funding into blockchain startup companies worldwide 2019 is 3.1bn USD.

6. Territory seen as leader in blockchain technology in 2018 is United States. While it is projected that from year 2021-2023 the leader would be China.

7. Industry with the highest perceived disruption by blockchain 2018 is Automotive. Approximately, 73% of respondents from the Automotive industry either somewhat agreed or strongly agreed that blockchain technology would disrupt their industry.

8. Most common type of blockchain model deployed in organizations worldwide 2019 is Private Blockchain.

9. Share of organizations with no interest in using blockchain as of 2018 is 34%.

10. Total number of Blockchain wallet users worldwide is 68.24 million.

4. CONCLUSIONS

The study signifies that the blockchain technology is about to cause a big transformation in Financial services. The technology seems promising to solve the inefficiency in problems by removing third parties, increasing efficiency, and decreasing cost. The five promising area where blockchain is going to impact are global payments, trade finance, insurance, capital market, and regulation & compliance.

The main purpose of the research is to get acquainted with the concept of Blockchain technology and its adoption in financial services along with the challenges and opportunities associated with this technology.

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