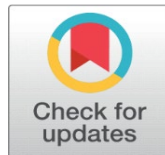
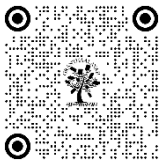


APPLICATION OF BLOCKCHAIN TECHNOLOGY IN BANKING SYSTEM-AN EMPIRICAL STUDY

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ABSTRACT

Blockchain technology has been gaining significant attention in the banking sector due to its potential to transform the industry by enhancing security, efficiency, and transparency. The Blockchain is a technology that will allow transactions simply, safely, effectively, and also safely. In layman's terms, Block-chain is a data structure that stores transactional records while also ensuring security, efficiency, transparency and decentralization. In a Blockchain, data is stored which is tamper-proof and cannot be changed as it uses encryption and digital signatures on every transaction on a blockchain, which proves the authenticity of the block-chain. To change a record on a blockchain, one needs to change several records, and one needs to change the distributed ledger. It's quite impossible to change the data which has already been entered into a Blockchain. This is a very promising technology. It's already in a lot of places. It can also solve any problem in the banking sector. This technology became famous after introducing the first cryptocurrency, which is known as bitcoin. The Blockchain has evolved to address various challenges in the Banking sector. This paper will demonstrate transacting over a secure, blockchain-based network and therefore eliminate the need for intermediary entities. The purpose of this paper is to provide a review of the application and opportunities of the Blockchain for a secure banking system and then the working method of the Blockchain technology has been introduced with analysis. The use of blockchain technology for secure banking has been discussed. The main achievement of this paper is to demonstrate how the Blockchain works and how it can be useful in the secure banking industry.

Keywords: Blockchain, Banking, Immutable Record, Distributed Ledger, Technology

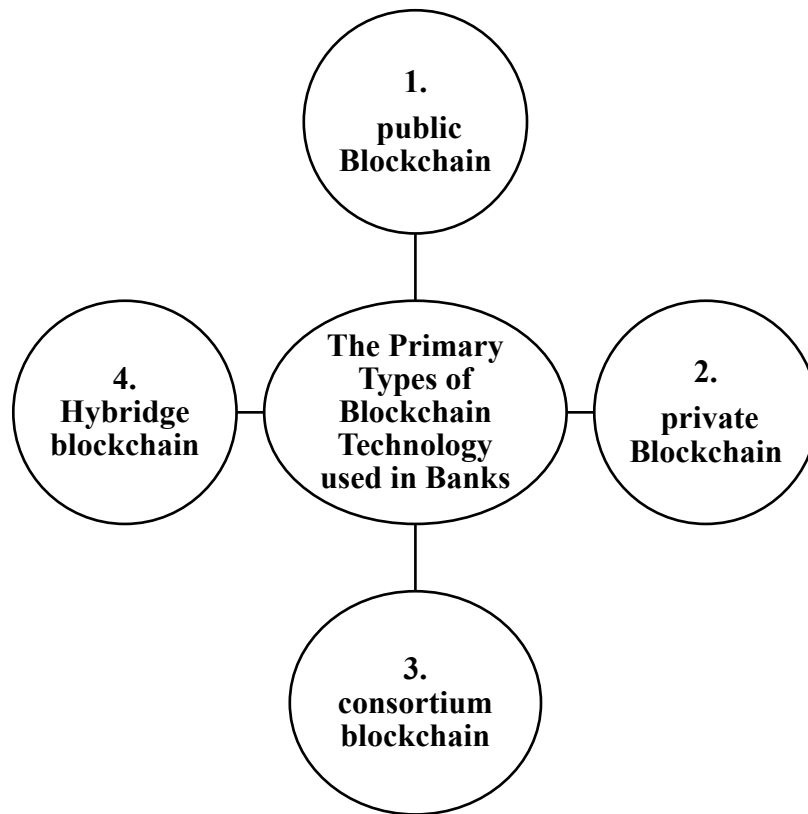
1. INTRODUCTION

A Blockchain is a technology that allows digital data to be stored in a public, shared database. It is essentially a series of immutable blocks. Blockchain has the potential to change the banking process to a secure and efficient process which will be a completely transparent procedure compared to traditional regular processes. This technology is well known as the crypto-currency (Bitcoin)'s backbone technology. In almost every sector, people are working so that they can use this amazing technology to solve their problems.

In recent years, it has been observed that there are many data breaches happening in the banking system. Hackers are stealing vast amounts of money from banks because of the security issue of the banking system. Also, the banking system is improving very slowly. Even in the 21st century, it takes a lot of time, sometimes days, to make transactions. The purpose of this paper is to analyze the Blockchain system and find its use cases in the banking system. It will demonstrate why the implementation of the Blockchain can make the banking system more secure and make

transactions faster. The significance of the paper is to help the decision-makers of the banking sector and government to make them understand blockchain technology and its potentiality in the banking sector.

2. TYPES OF BLOCKCHAIN TECHNOLOGY USED IN BANKING BUSINESS



- 1) **Public (open) Blockchains-** are the decentralized and open for anyone to join with base assets. They allow all participants to verify transactions and maintain the ledger, which enhances transparency and security. The principal motivation behind the open blockchain is to eliminate the middlemen and work with distributed exchanges. The cases where public blockchain uses in banking business include-
 - **Cryptocurrency Transactions-** it Facilitating peer-to-peer transactions without intermediaries. The base assets of public blockchains are Bitcoin, Ethereum, and other digital forms of money, which are straightforwardly accessible to anybody. Every exchange is confirmed by the organization before it is recorded.
 - **Fundraising-** It Enabling Initial Coin Offerings (ICOs) for startups.
- 2) **Private Blockchain-** are restricted to a specific group of participants, providing greater control over who can access the network. i.e. a permission-based sort. implying that members need consent from focal position to play out the assignment. It is completely de-centralized and constrained by the delegate. Every exchange is confirmed by power before it is recorded. Private blockchain is quicker and less expensive compared to public blockchain. It is generally reasonable for corporate business and administration models. It can possibly expand the proficiency and lessening the activity costs. This type of technology used by banks for internal operations for faster transactions and enhanced privacy. The Key applications include-
 - **Internal Record Keeping-** Managing sensitive financial data securely.
 - **Identity Verification-** Streamlining KYC (Know Your Customer) processes.

- 3) **Consortium Blockchain-** are governed by a group of organizations rather than a single entity. This type is particularly useful for collaborative projects among banks, allowing them to share data securely while maintaining control over their information. Key Applications include-
 - **Trade Finance:** Facilitating secure and efficient trade transactions among multiple banks.
 - **Syndicated Lending:** Allowing banks to share customer data for better credit assessments.
- 4) **Hybrid Blockchain-**It combine elements of both public and private blockchains, allowing for flexibility in how data is shared and accessed. This type is suitable for banks that require both transparency and privacy. The Key Use cases include-
 - **Cross-Border Payments-** It Enabling secure and efficient international transactions while maintaining compliance with regulations.
 - **Smart Contracts-**Automating agreements and transactions based on predefined conditions.

3. REVIEW OF LITERATURE

¹Melanie Swan (2015) explains that the “blockchain is a decentralized public ledger that can be used for the registration, inventory, and the transfer of all assets in finances, property as well as in intangible assets such as votes, software, health data, and idea” further. He considered the theoretical, philosophical, and societal impact of cryptocurrencies and blockchain technologies.

²Svein Ølnes (2015) studied the “potential use of the blockchain technology to enable governments to utilize the secure, open, distributed and inexpensive database technology”. It was emphasized that Bitcoin could be a promising technology for validating many types of persistent documents in the public sector.

³Yli-Huumo J, Ko D, Choi S, Park S, Smolander K (2016) studied the current research, drawbacks and the future perspective of blockchain technology from the technical point of view. The statistics shows that 80-percent of the research is only on Bitcoin as compared to other blockchain applications. Most of the studies are focusing on benefits of blockchain technology. However, many of the Blockchain scalability related challenges have been left unstudied.

⁴J. Leon Zhao, Shaokun Fan and Jiaqi Yan (2016) gave an overview of blockchain technology research and development. The study showed that the widespread use of Bitcoin in the financial and business sector will open new ways for business innovations and research.

⁵The Institute for Development and Research in Banking Technology (IDRBT), established by the Reserve bank of India (2017) has conducted extensive research to explore the applicability of blockchain technology in Indian Banking and Financial Industry. The paper explains all the aspects of blockchain like concepts, advantages, applications, challenges and future of blockchain technology in Indian Banking Sector. The Benefits of Blockchain is an emerging technology which can radically change the banking and financial sector, providing ample opportunities for growth and innovation, capable of reducing risk and cost.

4. OBJECTIVE OF THE STUDY

- **To examine the Working method of Blockchain technology in banking system**
- **To Identify the Benefits of application of Blockchain technology in banking business**
- **To Explore the key mechanism and challenges of Blockchain Technology**

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they make a protected advanced character to tie down computerized personality to confirm the client through computerized marks and for opening the exchange they need to perform.

1-2 Agreement-Client agreed and approved the exchanged transaction by agreement- when the clients have agreed on the exchange, it should be approved before being added to a block in the chain. Then the exchange agreement added to a public blockchain. The arrangement of rules by which a blockchain network works and approves the data in the block is known as a “agreement”. the exchange should be considered as substantial by dominant part of the hubs or Personal Computers in the organization before added to the blockchain.

1-3 Chart-2 showing the Proof of Work of block chain Technology

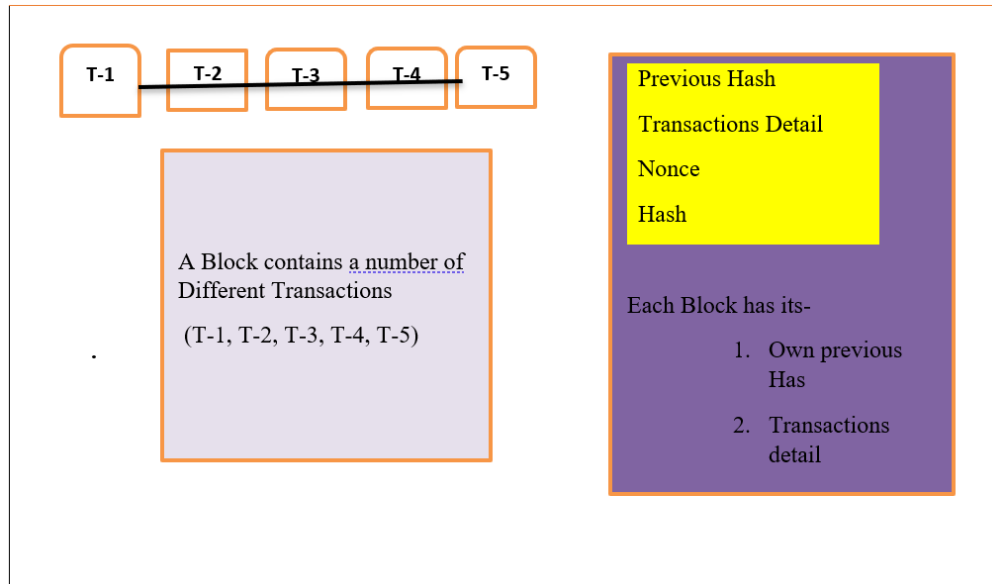


Chart-2 Source secondary data- Author compilation

Block- is a distributed database that maintains a continuously list of orders records. These blocks are linked using cryptography. Each block contains a cryptographic has of the previous block and Each block has details transactions data. Every Blockchain has **four** elements (heads) -namely Distribution, encryption, immutability, tokenization and decentralization. the details of these elements discussed are as follows

- 1) **Previous hash**— Hashing in blockchain-transaction details in a block is converted into a fixed length string of characters. this unique digital fingerprint ensures data integrity and immutability. The previous has block is situated at this hash address in each block. This Blocks have a reference to the previous block and also is mentioned in the preceding hash.
- 2) **Transaction details**—All the transactions details which need to occur are stored in the block. The block is created to store this information.
- 3) **Nonce**—For separating the block’s hash address, a numerical number is given in cryptography. This Number can be used only once. Miners adjust this number to make a valid number for the hashing value. With the perfect Nonce the hash value is calculated again which makes the hash more difficult to break.
- 4) **Hash address of the block**—An output is found for all of above when communicated through a hashing calculation. A 256-digit, 64-character length esteem is contained in that yield. That is what is known as the hash address of the block.

1-4 Mining- It enables banks to analyses customer data and extract meaningful insights by using advanced algorithms and techniques. process Mining enhances various areas of banking such as Know your customer (KYC), Credit application, customer relationship management (CRM) and Regulatory Reporting.

Second objective of the study

To Identify the Benefits of application of Blockchain technology in banking business

Recently, there have been significantly changes in banking business on account of the Blockchain. As the Blockchain technology permits untrusted gatherings to concur on the condition of a data set, individuals don't have to depend on agents for an exchange. Blockchain innovation offers multiple monetary types of assistance, for example, instalments, without utilizing any outsider like a bank. Blockchain can give quicker instalments and lower expenses than traditional banks, with the decentralization record for instalments. On open blockchains, protections like stocks, bonds, and elective resources are set. This makes more productive capital business sectors. The key benefits of Application of Blockchain in banking are given below-

Chart-3 showing benefits of Application of blockchain in banking

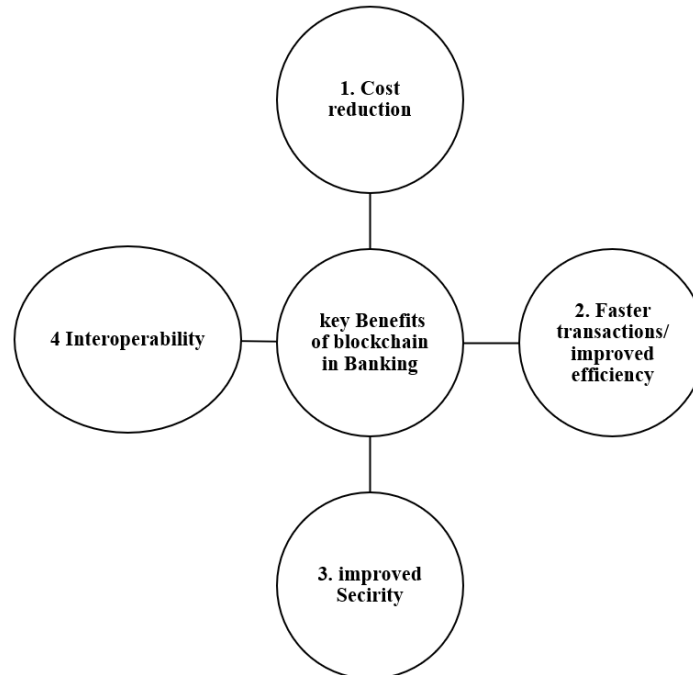


Chart-3 Source: secondary data- Author compilation

- 1) Cost reduction**— reducing the exchange costs between bank-to-bank exchanges by utilizing the Blockchain in the banking sector. It was found that Blockchain reduces up to 70% cost in central finance reporting. Block chain also reduce operational cost up to 50% by eliminating intermediaries in the banking process and streamline the process. this leads to significant cost savings for banks and customers

Chart-4 showing cost reduction by using Blockchain technology in banking sector - Global Annual cost savings equal to US \$12 billion

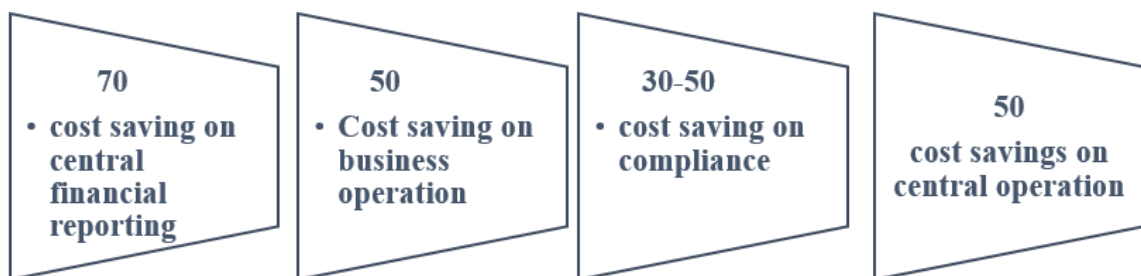


Chart-4 Source: secondary data- Author compilation

- 2) **Faster transactions/Improved efficiency**—Banks by Utilizing blockchain technology, exchanges can be made inside the space of seconds, which is quicker than most customary financial strategies. Blockchain keep away from agents, and enables the clients the creation of self- executing smart contract which can automate and streamline financial transactions. clients can make exchanges at a faster speed. This will bring about clients and banks ready to finish and handle more exchanges faster than traditional banking
- 3) **Improved security**—Blockchain technology used by banks to maintain transparent records of transactions, ensuring compliance with regulatory requirement such as anti-money laundering and Know-your-customer procedure and to have a better secure exchange data utilizing the assistance of shared records. Blockchain technology provides robust security features, including cryptography and decentralized network, which make it difficult to tamper with or falsify records this reduces the risk of data breaches and fraudulent activities It also generates credit reports and credit scores gives protection with monitoring and alert. Most of the banks worldwide trusted blockchain security in banking business
- 4) **Interoperability**-in Banking Blockchain used to connect different systems and net woks, enabling seamless communication and data sharing between different organizations and systems

The third objective of my study

To Explore the key mechanism and challenges of Blockchain technology

Mechanism

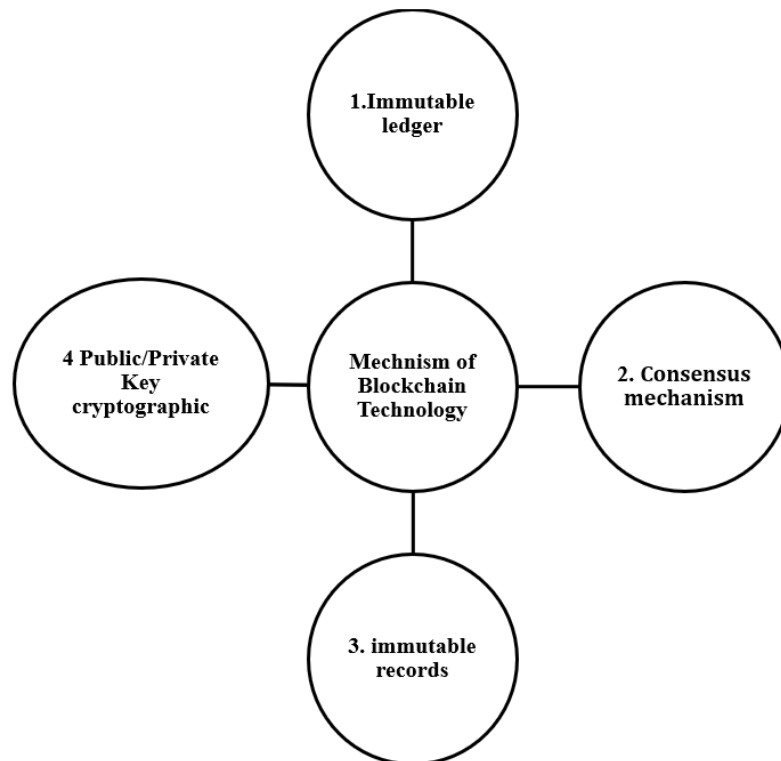


Chart-5 Source: secondary data- Author compilation

- 1) **Immutable ledger**- Blockchain operates on a distributed ledger, where multiple copies of the ledger are maintained across node (network of computers). Each node has a complete copy of the ledger, ensuring transparency as any changes made to the ledger are visible to all participants
- 2) **Consensus mechanism**-Blockchain relies on consensus mechanism such as proof of work to validate and verify the transactions. This ensures that all the participants agree on the validity of transactions
- 3) **Immutable records**- once the transaction is recorded on the blockchain it becomes virtually impossible to alter or delete. It ensures that transaction history remains transparent. Any modification of the records would require a consensus from the majority of participants

- 4) **Public/Private Key Cryptography-** blockchain utilizes cryptographic techniques to secure transactions. Each participant has a unique pair of keys (public and private). Where public keys is used to verify transactions and the private key is used to sign transactions. It adds an extra level of transparency and security to the blockchain.

Challenges

- 1) **Regulatory Compliance:** Ensuring that blockchain-based financial transactions comply with existing regulations is a significant challenge.
- 2) **Privacy Concerns:** Blockchain technology raises concerns about privacy, as sensitive data (e.g., personal identities) is stored on a public blockchain. Solutions like zero-knowledge proofs balance transparency with privacy.
- 3) **Scalability and Performance:** Blockchain networks face scalability and performance challenges, particularly in public networks, which can impact the efficiency of financial transactions.
- 4) **Security Risks:** Blockchain technology is not immune to security threats, such as smart contract vulnerabilities and hacking attempts, which can compromise the integrity of financial transactions.
- 5) **Interoperability:** Achieving seamless interoperability between different blockchain networks is a complex task, requiring standardized protocols to enable efficient and transparent financial transactions across multiple platforms.

Current scenario- several public and private banks have started to leverage the benefits of blockchain by partnering and investing in the fintech sector. For example, the State Bank of India tied up with JP Morgan to utilize its blockchain technology, and Axis Bank, ICICI Bank, and Yes Bank joined the Interbank Information Network launched by JP Morgan.

7. CONCLUSION

While blockchain technology offers the banking sector numerous benefits, it also presents certain challenges. It is still in its development phase and has many difficulties to overcome, including security, privacy, and scalability issues. The regulatory environment for blockchain and cryptocurrencies is also evolving, and there is a need for clear guidelines and policies to monitor and use of this technology. Despite these challenges, the potential benefits of blockchain technology far outweigh the risks. With the right regulatory framework and technological advancements, blockchain can truly revolutionize India's financial sector. Thus, the applicable specialists need to control and direct the entire cycle for the wellbeing of this gigantic measure of information. It may be seen very well that market is overwhelmed by a gathering of huge organizations uncommon in the tech area, where - Amazon, Google, Apple etc overwhelm. Along these lines, if any new start-up needs to utilize the blockchain in their plan of action, they can do so easily and without any problem. It is sure that if banking industry doesn't begin to utilize this innovation appropriately, it will deliver them outdated.

CONFLICT OF INTERESTS

None.

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