Block Chain Technology and Its Impact in the Business Environment

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ABSTRACT

Blockchain is a technology that can make a big difference in the business environment and will have a big impact over the next few decades. It can change the way we perceive business processes and transform our economy.

Blockchain technology is being researched and deployed to address a range of purposes, the majority of which have nothing to do with digital currency. Across a dispersed network, block chain provides a secure, immutable, traceable, and transparent way too transact. As a result, it's well-suited to use cases that are challenging to implement using traditional infrastructure. Block chain is a decentralized and distributed ledger technology that aims to ensure transparency, data security and integrity, since it cannot be tampered or forged.

This paper has been written with a quest to know about the current research related to block chain. The paper shed light on the use of block chain technology in other environments and sectors. This research paper will highlight that the Block chain technology is more than just a cryptocurrency. The authors will initiate with the basic definition of block chain, followed by the history of block chain, its benefits and limitations, and will also discuss about where it can be used in multiple applications for government, finance, banking, accounting and business process management. Thus, a large number of published studies were carefully reviewed and analyzed based on its contribution to the block chain body of knowledge. Therefore, this study attempts to investigate and explore its opportunities and challenges current or future applications of Block Chain Technology.

Key words: *Blockchain Technology, Ledger, Cryptography, Hashing, Applications*

I. INTRODUCTION

Blockchain technology is an active research area and technical choice for many companies and industries. With its distributed, decentralized, and trustless nature, blockchain can provide businesses with new opportunities and benefits through increased efficiency, reduced costs, enhanced integrity and transparency, better security, and improved traceability. The largest application of blockchain was in the financial and banking sectors, but now it has been observed via experimental and proposed applications in various areas. This document provides an overview of the blockchain technology. Bring together all the key design features, properties, and benefits of the blockchain into a great, unique technology, and it presents the popular consensus protocols and taxonomy of

blockchain systems. Additionally, the paper surveys blockchain based applications across multiple domains such as in finance, insurance, supply chain management, energy, advertising and media, real estate and healthcare. It aims to investigate key issues, blockchain solutions, and use cases in the industry. This white paper focuses on three common limitations of blockchain technology: scalability, security, and regulation, and shows how these challenges impact blockchain usage and adoption [1].

Blockchain technology is an innovative computing protocol used to digitally record and store information across multiple computers or nodes. One of the maximum crucial factors of Blockchain is "Ledger", that is just like a relational database. A blockchain is a list of encrypted digital records or transactions called blocks. Each block is then chained to the next block, in a linear, chronological order, using cryptographic signature. The block contains a copy of the latest transactions since the last block was added. Therefore, the shared block or ledger is connected to all participants using computers on the network to validate or verify transactions and eliminate the need for third parties. Blockchain's impact on industries is increasing rapidly. The technology has the potential to disrupt all the industries of the modern world with its decentralization and mutual trust behavior. Financial service providers were the first adopters of blockchain, but now, all industries want to try this technology. Supply-chain, healthcare, social media, entertainment, energy, gambling, gaming, robotics, analytics, marketing, real estate, retail & e-commerce, education, charity, legal, art and social media industries have their projects already proliferating in the market. The biggest advantage of a distributed ledger is maintaining an unchangeable shared ledger between two firms which gets automatically updated after every transaction [2].

II.   HISTORY OF BLOCK CHAIN

This section is dedicated to the history of Block Chain, starting from 1991 till now

- 1991- Stuart Haber and W Scott Shorten build the first cryptographically secure chain of blocks

- 1998- Nick Szabo, computer Scientist works on 'bit gold', a decentralized digital currency

- 2000- Stefan Kunst presented his theory of cryptographic secure chains and the proposal for implementing them.

- 2008- Satoshi Nakamoto, a pseudonym, produced a white paper that established the blockchain model.

- 2009- Nakamoto introduces Bitcoin, the first public ledger.

- 2014- Blockchain technology is decoupled from currency, and its application in other financial and inter-organizational transactions is investigated. Blockchain 2.0 is now available, with applications that go beyond currency [3].
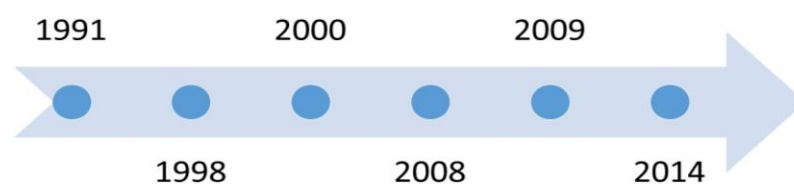

Fig.1: Timeline of Block Chain [3] [5]

III.   TYPES OF BLOCK CHAIN

Block chain technology branches can be categorized based on a variety of technology choices. As depicted below the main categories are public block chain, private block chain, and consortium. Block chain can be offered in a hybrid type as well.

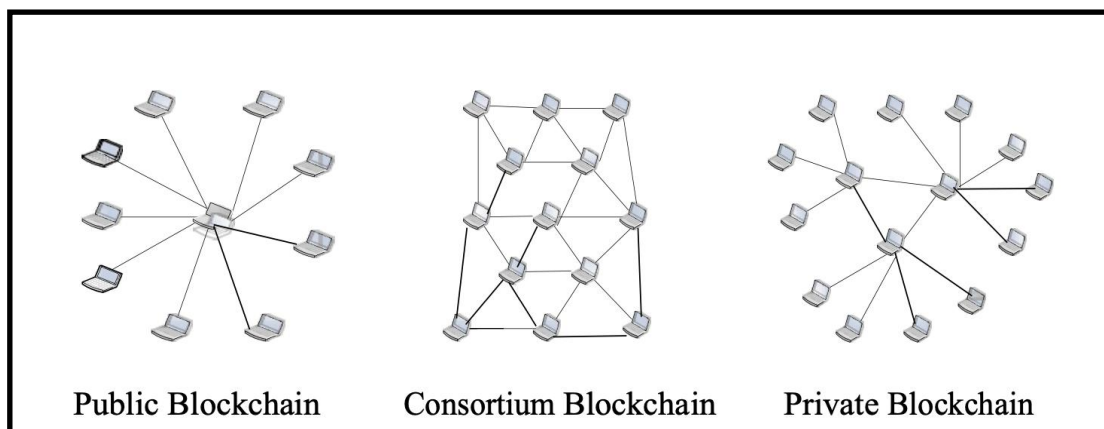Let us see in depth the meaning of these types in details:

Fig 2: Public Blockchain, Consortium Blockchain Private Blockchain

Blockchain automatically validates, and enforces the terms and conditions of the agreed parties. These contracts are called Smart because they can be partially or completely self-executing and self-coerced gates.

1.   **Public blockchain -** The word public means community. In other words, it means a public blockchain. Internet access can be registered with the blockchain and become an authorized node. After that, you are considered part of the network. It is a Ledger system that does not obey the permission.
The best examples are Bitcoin, Litecoin and Ethereum. In this system, the user has the right to perform mining, view current and past records, and validate transactions of an incoming call block. This is a fully decentralized system with evidence-based decision making with work and commitment. Because the public blockchain is completely open data tampering may occur. To overcome this, the public blockchain has a reward for honest action, punishment for wrongdoing. Therefore, the application of this blockchain required a high degree of caution.

2.   **Private blockchain-** This blockchain allows for closed circuits in networks that are not fully decentralized. A player who becomes part of a closed network. The opposite of the public blockchain with ownership of an organization or an individual. You have the authority to process mining decisions, read and access information. Nodes which will receive the transaction rights is decided by blockchain developers.

3.   **Consortium blockchain-** This blockchain is managed by multiple organizations, this is a combination of Public and Private blockchain network. The right to approve a transaction is done on the basis of an agreement. This is a semi-distributed blockchain managed by a group but not individuals.

4.   **Hybrid Blockchain-** This is a combination of public and private block chains in which users have the right to control that who can access which data in the block chain? Aergo is an example of a hybrid blockchain with both a permission less architecture and a permission architecture [4].

IV.   PROS AND CONS OF BLOCKCHAIN

In spite of the numerous potential benefits and application areas of Blockchain Technologies such as in - Government, Accounting, Finance BPM and several others, the literature presents various challenges and barriers that need to be addressed. The following summarizes the main advantages and disadvantages of Blockchain Technology [5] [6].

Advantages of Blockchain Technology

1.   **Available for all**: One of the most significant advantages of blockchain technology is that it is open to all. Anyone can contribute to blockchain technology, and joining the distributed network does not require permission from anyone.

2.   **Stability**: It is exceedingly difficult to remove or edit data after it has been registered on the blockchain. Blockchain is a great solution for storing financial records and other data that requires an audit trail, as all changes are monitored and permanently recorded in a decentralized public ledger.

3.   **Data integrity and Immutability**: Blockchain technologies are built in such a way that every block or transaction added to the chain can't be changed, resulting in a very high level of security. Data in blockchain technology cannot be tampered with because of its decentralized nature, which means that any modification will be reflected in all nodes, making it impossible to commit fraud. As a result, transactions can be claimed to be tamper-proof.

Participants can reduce fraud while strengthening regulatory compliance. Once the record is saved in the general ledger, it can only be deleted after approval.

4.   **Durability and Security**: One can compare it to the internet, but with built-in scalability. In actuality, the technology's general structure is what makes it so long-lasting. Furthermore, because it distributes data blocks across the network, it ensures that there is no single point of failure or control. Therefore, the system is built to last. Furthermore, because no one can change the blocks, it remains a safe and secure platform. Aside from that, it's pretty effective at thwarting hacker efforts.

All transactions will be digitally time stamped with a cryptographic hash code, a unique 64-digit alphanumeric signature is recorded corresponding to every single transaction.

5.   **High Quality Data:** Due to decentralized networks, Blockchain Technology data would be complete, timely and accurate.

6.   **Sustainable**: Blockchain technology is used to store information in a decentralized fashion so that everyone can verify its accuracy via zero-knowledge proof, in which one person verifies the accuracy of data to another without giving any information about the data.

7.   **Reliability**: Blockchain Technology it is not regulated by a single control center and there's no single point of failure.

8.   **Disintermediation:** Blockchain data is frequently stored on hundreds of devices over a dispersed network of nodes, the system and data are extremely resistant to technical failures and malicious attacks. There is no single point of failure because each network node is able to duplicate and store a copy of the database. Blockchain is a distributed and decentralized technology peer-to-peer transaction, removing the need for a third-party to intermediate, avoiding all the additional overhead cost and transaction fees.

9.   **Transparency and Consensus:** All transactions conducted on the Blockchain Technology are transparent by any counter-party and allow for subsequent audits anytime. The shared ledger includes the details of the original source, destination, time and the date of the transactions

10.   **Automation**: Blockchain Technology uses Smart Contracts which are self-executed code commands that can be stored and executed on Blockchain.

11.   **Processing Time:** Using Blockchain technology one can reduce time for processing transactions or records, approximately from 3 days to minutes or seconds.

12.   **Traceability**: The Blockchain structure is meant to generate an irreversible audit trail, making any addition to the chain easy and accessible to trace.

Disadvantages of Blockchain Technology

1.   **Costof implementation is high:** Unfortunately, while this technology offers inexpensive costs to customers, it also comes with substantial implementation costs for businesses, delaying its widespread adoption and implementation.

2.   **Inefficiency:** Multiple network users certifying the same actions is inefficient because only one will obtain the reward derived from the mining process. This technique, plus the fact that many people are doing the same thing, entails a significant waste of energy and is not an environmentally friendly technology.

3.   Private Keys are only available to you. In the case of private keys, as has been shown on numerous times, once lost, these keys are nearly impossible to retrieve, posing a challenge for all cryptographic value holders.

4.   **Storage**: As the number of users' increases, so will the number of operations that must be integrated into the blocks to be stored, requiring more room within the miners' computers, eventually exceeding the hard discs' capacity.

5.   **Unemployment:** there would be no need for intermediaries once Blockchain technology is adopted and implemented, all of these intermediation sectors for payment and process validation will be forced to close.

6.   **Data Deformability Issues:** Data transformability is a potential issue in blockchain implementations. The signature does not guarantee ownership. An attacker could modify a transaction and resend it, which could lead to transaction verification issues.

7.   **Scalability:** Due to the fixed size of the block for storing information, one of the greatest downsides of block chain technology is that it cannot be scaled. Because the block size is 1 MB, it can only carry a few transactions on a single block.

8.   **Difficulty of Development:** From the start, it's critical to use fairly sophisticated protocols to reach consensus and allow for scaling. Without a network redeployment or fork, it would be impossible to quickly implement an idea in the hope of adding functionality and extending the application later.

9.   **Latency issues:** Time factor is one of the most critical issues in Blockchain implementations, since it is not appropriate for massive transactions, due to complex verification process

10.   **Inefficient:** Blockchain are inefficient, especially those that use Proof of Work. Because mining is very competitive, with only one winner every ten minutes, all other miners' efforts are wasted.

11.   **Integration concerns:** Blockchain Technology offer solutions that require significant changes of existing legacy systems in order to incorporate

12.   **Immaturity of the Technology:** Blockchain is a new technology, represents a complete shift to a decentralized network and might lead organizational transformation, including changes in strategy, structure, process, and culture.

V.   HOW BLOCKCHAIN TECHNOLOGY WORKS?

Blockchain technology is an ever-growing list of records, called blocks, that are linked and protected using encryption. Each block typically contains the cryptographic hash code of the previous block, a timestamp, and transaction data (Bogart & Rice 2015) designed to make these transactions immutable[2].

How it works?

Blockchain is a similar database that allows multiple users to record and makes changes in it. Once the data is entered, it cannot be deleted changed because it only provides the ability to add data. Once the majority of participants which are included in the blockchain provides consensus to confirm the authenticity of data only then a data can be added to the Block chain. This process called "mining". Data is represented as a block in the network. Data is sent and validated over the blockchain network using a consensus mechanism. A new block will be generated when the block is considered genuine by the network. Then it is added to the latest state of the blockchain.
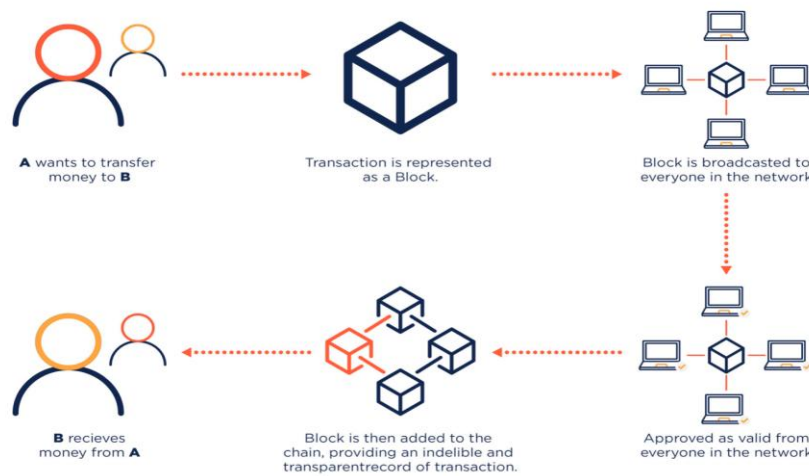
Fig. 3. How a transaction works

In a distributed system, information is not stored in one place. Every time a new change occurs or a new transaction occurs, the node checks the transaction first, then gets a copy of the new status of ledger. A full node is basically a device (such as a computer), not a human which performs the validation task manually. However, the entire blockchain data is published on the internet and anyone can be a node and download the same one. All nodes in the blockchain are interconnected and constantly exchanging the latest blockchain data with each other and all nodes up to date. They save, distribute, contain the blockchain data. Therefore, in theory, the blockchain resides on the node.

VI.   The Applications of Blockchain Technology in Business

According to our literature, we focus on six specific areas where blockchain use cases have been found. H. Cryptocurrencies, e-government, Supply management applications [5].

- **Cryptocurrencies**: Cryptocurrencies form an important area of blockchain technology applications. The main focus here is on using cryptocurrencies as a payment solution. Cryptocurrencies can also be used as an incentive mechanism for proposing ideas in group projects that transcend departmental boundaries. The entire procedure is accomplished through smart contract technology that automatically rewards groups who are able to find the best ideas with a predefined amount of digital coins. Open Bazaar which is a Bitcoin-based multi-signature protected decentralized marketplace that enables free e-commerce transactions with no platform charges. The Internet of Things is expected to include sensors connected to the Internet. These devices are expected to access and generate vast amounts of information. To that end, anything that produces an item of information can create a smart contract that accepts a set of virtual digital coins as input and issues a payment receipt.

- **E-government:** In recent years, e-government services for citizens, businesses and public institutions have expanded significantly. Blockchain technology enhances innovative applications and acts as a platform for processing information transactions, including asset digitization (money, stocks, property rights, etc.) and decentralized exchanges (peer-to-peer exchanges). This makes the vote transparent and allows everyone to read and confirm the vote, preventing the government from fraudulently conducting elections.

- **Supply Chain Management Applications:** Blockchain era can enhance transparency and responsibility in deliver chain systems. Blockchain allows high-satisfactory, outcomes, and overall performance of powerful deliver chain control (SCM) processes. Once monitoring information are entered onto a blockchain ledger, they turn out to be immutable. Blockchain will increase accept as true with among providers within side the chain as all are enabled to music shipments, deliveries, and progress. Blockchain gets rid of intermediary auditors; thus, it will increase performance and lowers cost, and providers can perform their very own tests and balances at any time [6] [7] [8]. Blockchain can beautify the size of product high-satisfactory even as it's miles transported. For instance, simply via way of means of reading records on a products transport route and duration, deliver chain stakeholders can decide if a product became now no longer within side the proper region or became saved for too long.

These problems are crucial with regards to refrigerated goods, which require greater unique and cautious handling. In this manner, blockchain-primarily based totally answers may be used to make sure the genuineness and high-satisfactory of merchandise [6].

- **Logistics:** Blockchain may be utilized in logistics. Logistics control is related to a few complexities. For instance, numerous organizations are worried within side the sports and synchronized sub-sports that numerous establishments perform, along with plants, garage firms, transport organizations, and regulatory entities. Thus, it's miles vital to have logistics control packages with superior embedded capabilities that facilitate planning, scheduling, coordinating, monitoring, and validating those sports. Blockchain era can successfully and securely help those capabilities. The software of blockchain in coping with logistics transactions will bring about discounts in processing times, control costs, and human errors. Additionally, the use of clever contracts will beautify agreements and contracts amongst worried events quicker and at a decrease cost.

Many blockchain-primarily based totally deliver chain and logistics control systems and packages had been advanced and used to understand those advantages of blockchain and its substantial effect at the SCM and logistics enterprise. IBM has advanced a blockchain-primarily based totally meals- traceability platform. The pilot section in 2018 has already visible hundreds of thousands of meals merchandise tracked via way of means of stores and providers, along with Walmart, The Kroger Co., Driscoll's, Dole, Golden State Foods, McCormick and Co., McLane Co., Nestle, Tyson Foods, and Unilever. Maersk, a Danish transport organization, is the use of blockchain to music all its shipments throughout the world, with attributes inclusive of condition, temperature, and location. Another instance is Provenance, which piloted a traceability undertaking in Indonesia's fishing enterprise via cellular phones, blockchain, and clever tagging. The organization ought to correctly music fish for the primary 1/2 off of 2016 [6].

VII.   Case Study

Now the authors would like to highlight a few case studies which demonstrateshow innovators in the multiple industries are transforming their businesses through use cases built on the Blockchain Platform. Let's explore

the case study of the present phenomenon of Blockchain diffusion in the context of business model of financial institutions. Some cases of both the context are as follows [9]:

- **Vertrax: Igniting accomplishment in a multi-cloud deployment**

The Vertrax Blockchain – assembled on the IBM Blockchain Platform and arranged on AWS for multi-cloud users – brings new insights into those events for quicker responses. It is the first multi-cloud deployment of the IBM Blockchain Platform composed to reshape the oil and gas supply chain while illuminating a path for other industries to follow. The oil and gas supply chain is a difficult interplay of coordination and competition. But extreme weather and other unpredicted events can cause havoc, and the entire supply chain suffers.

- **Golden State Foods: A taste for collaboration**

As food travels through the supply chain, it's always a matter of great concerns that it reaches fresh, but how anyone can be sure of its exact condition?

By using blockchain, IoT and cognitive analytics, Golden State Foods, CTO Guilda Javaheri and her team have started providing quick-serve restaurants; unparalleled transparency into food's journey to the customer at every step. The GSF blockchain solution is a conjunction of all the technologies like IoT, cognitive analytics and blockchain through IBM Food Trust to track, trace, and monitor the freshness of the product as it goes through its supply chain journey, as well as providing inventory prominence at all times through the shelf life of the item.

They did a pilot study to know about the results, launched with just one product and they used RFID solution to track the case as it comes to the production line, IoT sensors to keep a note about the temperatures as it moves further through various stages of the supply chain, storing all the data in blockchain. Business rules composed by blockchain alert them when there's any variant in the temperature of the product to ensure the freshness as it reaches the restaurant or hotel.

The benefit of blockchain in amalgamation with other advanced technologies ensures the freshness and also helps the restaurant manager/ head chef to ensure the shelf life and consume the product accordingly to avoid minimal wastage and assuring the good food quality.

It also avoids waste at the manufacturing level, because the solution brings transparency throughout the supply chain; the manufacturer can see inclinations in consumption and can adjust the production schedule. They don't have to wait for the distributor to give them an estimate rather they can track in real-time. Similarly, the distribution side, can also decrease the wastage as they have more accuracy about the type of product they are carrying through their inventory.

Cases in the financial institutions

- **JB Bank:**

JB Bank delivers an easy login service founded on the Open Keychain technology of Blockchain for the New Smart Banking App, which is the new version of mobile banking. Customers can simply login by installing the Blockchain Certificate in the JB Bank, banking App and then put the password for the e-certificate. The service

is restricted to just easy logins, and thus customers cannot use Blockchain-based authentication in procuring financial products and services. It is known that JB Bank plans to relate Blockchain-based authentication service to all online financial services [10].

In this case, Smart Easy Login service applied to mobile banking App of JB Bank is limited to increasing expediency of the mobile App banking service with the Open Keychain technology of Blockchain.

- **KEB Hana Bank:**

KEB Hana Bank has been contributing in R3CEV, which is a global Blockchain consortium, from 2016 until now, and is validating Blockchain technology by implementing payment, settlement- and authentication-related projects [11]. KEB Hana Bank is using Blockchain as follows: using Smart Contract, which is a digital programmed contract of Blockchain, KEB Hana Bank made non-deliverable in Korean currency process into an automatic process, and through Blockchain-based customer authentication, customer authentication process (CDD/EDD) is programmed to prevent money laundering. Through this automation process, it is anticipated that cost will be reduced and efficiency will be boosted.

It is determined that KEB Hana Bank has set its planned goal as reducing cost and increasing competence by making Blockchain-based non-deliverable in Korean currency, and customer authentication process spontaneously. In this case, rather than innovating the business model using the Blockchain technology, it is merely refining the business process.

VIII.   Conclusion and Recommendations

Blockchain is a promising technology and is widely valued and accepted due to its decentralized infrastructure and peer-to-peer nature. Through its design capabilities, blockchain has the potential to facilitate complex processes such as transaction validation, coordination and settlement, and dispute resolution. Blockchain can also transform traditional businesses with essential characteristics such as decentralization, anonymity, immutability and audibility. Blockchain is designed to eliminate the role of intermediary, especially in the area of financial transactions, so it uses a decentralized consensus protocol to process and validate transactions. PoW, PoS, PBFT, and DPoS are the most commonly used consensus mechanisms in existing blockchain systems. Blockchain was introduced as a decentralized public ledger.

However, there are currently different types of blockchain systems. The blockchain network can be public, private, or consortium. The choice of blockchain system depends on key factors such as investment capacity, required privacy and goals. For example, financial institutions are interested in private blockchain because they value the privacy factor. In contrast, companies with similar activities and goals are willing to share costs and data and can opt for a consortium blockchain. Blockchain has shown its value through cryptocurrency applications, which are now beyond the realm of digital currencies. Blockchain with the same functionality can be used in a variety of areas, including advertising and media, energy, real estate, and healthcare, as this document shows. These various industries are becoming more and more interested in blockchain, its

potential and application as it can no longer resist the main advantages of blockchain: transparency, business continuity, disintermediation and trust. I'm starting to look for sex. Since blockchain enables smart contract functions, many smart contract applications have been proposed in various fields. Everyone knows that blockchain has a lot of potential to solve problems. However, we are also beginning to see some of the problems facing blockchain. Especially in terms of scalability, security and regulation. To make the blockchain more efficient and durable, it is important to address the current limitations of the blockchain.

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