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A Review on Block Chain Technology

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ABSTRACT- Block chain is the foundation of all cryptocurrencies, including Bitcoins. Without the need of a third-party media, Blockchain is utilized for bitcoin transactions all around the world. Blockchain is used for worldwide decentralized transactions in the same manner that the internet is used for global decentralized communication. It aids in the protection of both the provider and the customer from third-party participation, the establishment of a tolerance network, the prevention of data tampering, and the lowering of operating expenses. It was first invented in 1991 and reintroduced to the world in 2008 by Satoshi Nakamoto, and now, with Blockchain 2.0, it is expected to be used not only in cryptocurrency but also in the electronic industry, including supply chain management, electronics manufacturing, and power and energy systems. Blockchain is a new kind of information technology that has the potential to transform technology, business, and commerce by making it more transparent, secure, and dependable. The decentralized record-keeping potential of block-chain is unlimited. This technology may be used in a variety of applications in the future, from increased user privacy and security to cheaper processing costs and fewer mistakes owing to less human involvement.

KEYWORDS- Block-chain, Supply Chain Management, Crypto currency**.**

I. INTRODUCTION

"The block-chain is an incorruptible digital log of economic transactions that can be designed to record not just financial transactions but practically anything of value," according to the authors of "Block-chain Revolution," Don & Alex Tapscott. A block-chain is a literal chain of blocks that are time-stamped and include many pieces of data that are available to every block-chain user. A block-chain is a public database that includes all digital information and is secured by methods like time-stamped information and transactional data available in every node[1].

Block-chain technology was first developed for decentralized global transactions in the form of bitcoins, but as technology advances and new innovations emerge, block-chain technology is rapidly expanding beyond cryptocurrency to include consumer electronic products, supply chain management and monitoring, identity verification, and even fraud management. It is decentralized because all data is not held by a single authority and transactions are verified by a number of computers, resulting in increased transparency, accountability, and incorruptible records of transactions between suppliers, who provide base material, and consumers, who are end product users, so that product manufacturing companies are not harmed. The following are some of the characteristics of block-chain technology:

- Decentralized transactions that do not depend on the confidence of a third party
- Networks that are more resilient as a result of shared data and system management
- Because previous data records are time stamped, they cannot be tampered with, and only new entries may be added.
- Adding new entries to the block-chain, as well as every transaction, requires the agreement of all parties involved.
- Both infrastructure and operating expenses may be significantly lowered.

Block-chain technology may or may not be the future of the internet, but it is undoubtedly the future of supply-chain management, as it is already being used by companies such as Walmart, Maersk, British Airways, and FedEx to manage their supply chains, from cargo data to restocking processes, saving time and money. This article provides an overview of Blockchain technology and its current applications in various sectors.

In the case of current electronic components industry supply-chain infrastructure, a basic block-chain mechanism is as follows: as semiconductors become more widely used, there is a serious threat of counterfeit components being provided by industrial suppliers, leading to the use of sub-standard components, resulting in financial losses and brand image damage. The use of block-chain technology may help to address this issue. Block-chain technology may be used to monitor and verify each stage of a product's life cycle, from raw ingredients to production processes to delivery dates to warehouses and the consumer's home. The use of block-chain technology in supply-chain management reduces production delays, ensures that goods comply with industry standards, and prevents the sale of counterfeit copies. Every digital information will be recorded and time-stamped, resulting in the creation of a record that can be easily traced. This will improve accountability and transparency at every stage of the supply chain[2,3].

II. BLOCKCHAIN BASIC CONCEPTS

As a result, Block-chain carefully records each transaction and disseminates the encrypted data among decentralized nodes. It's a decentralized database that relies on consensus algorithms for decision-making and encryption techniques for security. It is a digital library that maintains records of all information in the form of encrypted blocks that are connected to one another in the form of chains after being validated via specific certifications to prevent tampering with digital documents' contents. Each block is linked to the one before it to create a record chain known as a Block-chain(4–6).

A. Block-chain Types

Figure 1 shows the types of Block-Chain such as general block-chain, private block-chain, consortium block-chain.

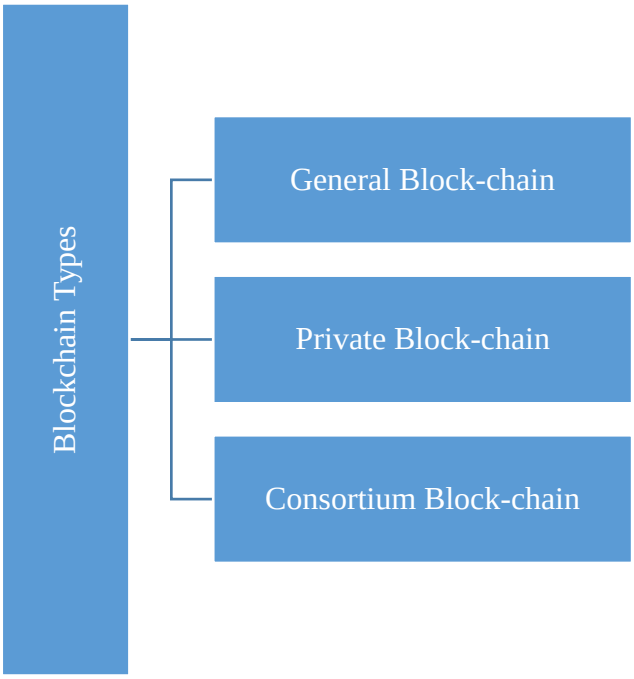

Figure 1: Illustrates the types of block-chain general, private, consortium

B. General Block-chain

This is an open-source and decentralized block-chain in which everyone has access to transaction information and may participate in transactions, consensus processes, and voting. This is also known as an open chain, and it is utilized for business reasons.

C. Private Block-chain

Personal records, medical records, and private business records are examples of items that belong to a particular individual. The transactions are reversed, and the validators are authenticated there, helping the consensus process run quicker. This kind of block-chain is not decentralized since the transactions are reversible. This kind of block-chain is appropriate for database administration, inspection and auditing, as well as other internal business operations.

D. Consortium Block-chain

Only a few nodes are granted authority to validate the block-chain, making it a nearly decentralized network.

E. Proof

Block-chain is a system in which there is no centralized trusted authority, and it needs a consensus mechanism for its nodes as a validation technique, but no third party is required to validate it. Any transaction must be authorized by 51 percent of the nodes in the block-chain network to be legitimate. In a block-chain, various consensus methods are used, such as:

- A sample of your work
- Stacking proof
- Validation proof

The following are the mechanisms used by block-chain to ensure the block's security and decentralization:

- A hashing algorithm
- Proof-of-work
- A peer-to-peer network in which each user receives a complete copy of the block-chain.

The block-chain method will be discussed in this article as it relates to supply-chain management and electronics management services. Due to significant friction between the parties involved, when the production of a single product is a multi-party process, and when there is a lack of confidence between the businesses involved, block-chain is utilized in the manufacturing industries or supply chain management.

F. Block-Chain Helps in Resolving the Above Issues by the Following Process Supplier Contract Management

Smart contracts may be used to enhance transaction efficiency, provide transparency to the process, speed up the execution time, aid in quicker dispute resolution, and eliminate the bother of maintaining a paper contract.

G. Digital thread

It is utilized in the manufacture of goods involving many businesses because it develops a communication structure that links components in the manufacturing process and offers an integrated asset view, which improves trust between the organizations.

h) Monitoring the production process

This enables manufacturers to maintain track of goods produced by their electronic manufacturing services in real time, resulting in better authentication and product tracking.

- Asset maintenance monitoring: Block-chain aids in asset tracking when many parties are engaged.
- Tracking recalled goods: Block-chain records every step of a product's path from production to assembly to finish until it reaches the customer.

1) Blockchain in manufacturing supply chain management

The following are the steps involved in the supply chain management in block-chain (7,8).

- Involved in the block-chain system interface.

- A mobile app for businesses and merchants Suppliers, manufacturers, and
  - The QA team all have their own websites.
  - In the block-chain, there are nodes.
  - Merchants - the individuals who made the order
  - A manufacturing company is one that creates a product.
  - Suppliers- companies that supply raw materials to manufacturers.
  - A logistics company is engaged in the product's distribution.
  - Quality Assurance Team - to ensure that the product is of high quality.
  - Merchants place orders by logging onto the website and completing product needs forms. When the merchant fills in the information, a block is created that includes the timestamp, hash value, previous hash value, and other digital and transactional data.
  - The manufacturing business gets the order, after which the manufacturers may access the stored data in the block using the hash address provided by the merchant, and the manufacturing firm creates a Bill of Material based on the product requirements (B.O.M).
  - Various vendors are contacted in order to get the product's basic ingredients. Smart contracts are created and suppliers are informed about the new order as soon as the information and kind of material are changed in the block-chain.
  - The block-chain is used by the supplier to receive a fresh order of raw materials from the manufacturing firm. Now, suppliers must upload the invoice together with pictures of the raw materials to the block-chain in order to keep all stakeholders or nodes up to date.
  - As a result, the block-chain nodes verify new information supplied by the supplier. The next stage is to send the raw materials to the producer and update the information in the block-chain, such as the kind and amount of the order.
  - After the supplier has packed the order, a logistics service provider is called to deliver the goods to the manufacturer, and the block-chain status is updated.
  - On the block-chain, the logistics service provider adds the delivery information, dispatch time, driver name, vehicle number, number of cartons received from the supplier, and kind of goods.
  - By accessing the recorded information on the block-chain, nodes in the block-chain network may verify that the number of received goods matches the number of products sent by the provider.
  - When the manufacturer receives the order, the quality of the material is checked, and if the components do not meet the requirements, a recall request is sent to the supplier; otherwise, if the quality of the material received is satisfactory, payment is made directly to the supplier in their account in accordance with the smart contract's regulations.
  - All transaction data are stored on the block-chain, and a copy of the block-chain is distributed to all nodes in the network. The items are turned over to the QA team for a quality check after the goods have been received by the manufacturer and the delivery quality has been verified.
  - Following the quality inspection, the QA team enters the information into the block-chain manufacturing platform. The following data is recorded on the block-chain:
  - Techniques used during product testing
  - Product specifications
  - The outcomes of the tests
  - Certification of the product
  - The finished product must then be delivered to the merchant. The manufacturer uploads the product's production cost invoice and shipping information to the block-chain, which the merchant may see. Other stakeholders will be able to see this, and the block-chain network will aid in the system's fairness and confidence.

III. PROS AND CONS BLOCKCHAIN

A. Pros of Block-chain

1) Chain Accuracy

Transactions on the Blockchain are validated by a network of thousands or millions of computers linked to the block-chain. As a result, human involvement in the process is reduced, and accuracy is improved by reducing human error. Only if a transaction is confirmed by at least 51 percent of the network's computers is it propagated throughout the remainder of the block-chain(9).

2) Operational cost-cutting Measures

Block-chain eliminates the need for a third party in any operation, such as international money transfers in the form of bitcoins, which formerly required going through a bank and costing a lot of time and money.

3) Decentralization

Block-chain does not rely on a central authority to keep track of its digital data. Instead, the data is duplicated throughout the block-chain and distributed across a network of computers. Block-chain makes it more difficult to tamper with information by disseminating it throughout the network rather than keeping it in a single central database.

4) Transactions

Transactions take approximately 10 minutes to complete and are deemed secure after just a few hours. All transactions are kept secret and discreet, as are the identifying information of the individuals who make the transactions. The block-chain network as a whole verifies the validity of every transaction. As a result, transactions are safe, private, fast, and traceable.

5) Transparency is a term that refers to the ability to see things clearly

Because block-chain is an open source technology, individuals may make changes to the code as long as they have the support of a majority of the network's computing power. A single source is always the beginning of a block-chain.

B. Cons of Block-chain

1) Cost of Technology

The cost of the energy required to validate block-chain transactions is comparable to Denmark's yearly electricity consumption. Infrastructure, power, and mining expenses are all part of the technological cost, which contributes to increased energy usage. As a result, infrastructure gets more costly as technology prices rise(10).

2) Inefficiency in speed

In block-chain, adding a block to the current network of the block-chain takes approximately 10 minutes.

3) Susceptibility Hack

Attackers may rent computing capacity rather than purchasing all of the equipment, making younger crypto currencies and block-chain networks vulnerable to 51 percent assaults.

IV. DISCUSSION

Block-chain technology may also be used to store digital data, various kinds of transactions in the electronics or supply-chain sectors, electoral voting, and information regarding property exchange, among other things. Figure 2 shows the application of Blockchain.

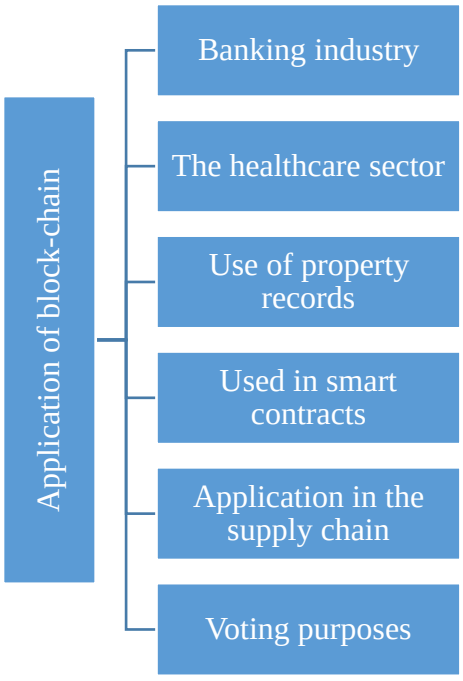

Figure 2: Illustrates the several application of block-chain

A. Banking Industry

Even if the number of transactions that the bank has to settle is large, incorporating block-chain into the banking industry would increase transparency and speed up processes in the system. Regardless of the date or time of deposit, each transaction will take about 10 minutes to complete.

B. The Healthcare Sector

The patient's medical record may be stored on the block-chain and accessible by other physicians using a private key to view the patient's medical history, making illness diagnosis easier.

C. Use of Property Records

Registering property titles on the block-chain so that they can be validated by government workers and the local recorder's office, making the procedure more efficient, time-consuming, and affordable.

D. Used in Smart Contracts

Smart contracts are self-executing contracts in which the ledger automatically enforces the contract's terms and conditions. Smart contracts improve the productivity, profitability, and security of the company model.

E. Application in the Supply Chain

Block-chain technology may assist to simplify the end-to-end supply chain process, thereby saving time and money. Because block-chain records the whole process of component production, assembly, and marketing, the records are digitally permanent and auditable, keeping everyone responsible at every stage.

F. Voting Purposes

Because each vote will be recorded as a block in the Blockchain, making it difficult to tamper with, using block-chain in elections would eradicate election fraud and increase voter turnout.

V. CONCLUSION

The usage of block-chains, which began with cryptocurrencies, has spread to industrial, retail, and customer-based industries. With block-chain technology, the system's confidence and fairness are maintained since it not only makes the system visible to all process players, but it also leads to the responsibility of the person in charge of the job. It leads to improved system governance without the need for third-party involvement. It lowers the system's operating costs and, thanks to the safeguards built into block-chain technology, it reduces data manipulation. Block-chain technology may assist with supply chain visibility, managing difficulties in the initial electronic manufacturing supply chain, and managing the complexities of the electronics value chain. With the rate of technological advancements, it will only be a matter of time until all businesses use block-chain technology for all of their processes, and block-chain will become a major tool in bringing massive changes to the sector. Decentralized transactions are possible thanks to block-chain. With future technological advancements, it offers enormous potential in the fields of data storage, transaction execution, and ensuring integrity and secrecy in an open environment.

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