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The blockchain which was mainly popularized by Bitcoin cryptocurrency can be defined as a decentralized, dispersed database with an aim of storage the transaction information. Instead of being dependent on centralized agents, the blockchain technology allows two participants to counteract directly with a help of reproduction, related ledgers called blockchains. Such process makes the operation more clear than if it was completed by centralized systems. Therefore, transactions are fulfilled independently from a third participant and is based on decentralized trust with a permission of the network. (Francisco and Swanson, 2018)

Blockchain uses equally dispersed ledgers that have been created on a series of innovations used for consolidation and distribution of digital data. As stated by Seebacher & Schüritz ,

“A blockchain is a distributed database, which is shared among and agreed upon a peer-to-peer network. It consists of a linked sequence of blocks (a storage unit of transaction), holding timestamped transactions that are secured by public-key cryptography (i.e., “hash”) and verified by the network community. Once an element is appended to the blockchain, it cannot be altered, turning a blockchain into an immutable record of past activity.”

The method of “hashing” converts tangible and intangible assets into a digitally encrypted “token” and can be registered, tracked, and traded with a personal key on a particular blockchain. As exhibited by Bitcoin, the technology laid beneath the digital currency establishes a verified, operative mechanism for achieving distributed consensus in a dynamic, unreliable networked environment of untrusted participants. (Francisco and Swanson, 2018)

One of the most promising implications of blockchain technology includes those in the supply chain.

The growing use of Internet of Things (IoT) applications is one of the trends that will affect supply chain management (SCM). With IoT, RFID (radio frequency identification) tags, sensors, barcodes, GPS tags and chips, the location of products, packages and shipping containers can be traced at every step. This allows an improved tracking of goods in real time from the moment they were sent from their origin.

Hence, a need has arisen for a secure path for a verified identity in IoT applications. The first direct benefit of blockchain is that it offers a potential identity management solution . Blockchain can be used in the supply chain to know who is doing what. In addition, you can determine the time and place of action.

Blockchain enables reliable and efficient measurement of the results and performance of key SCM processes. Once the tracking input is in the blockchain ledger, it is immutable. Other suppliers in the chain can also track shipments, deliveries, and progress. In this way, blockchain builds trust among providers. Eliminating interim auditors can improve efficiency and reduce costs. Individual vendors can perform their own checks and balances in near real time.

Blockchain also provides an accurate way to measure product quality in transit. By analyzing route data and trip duration, stakeholders in the supply chain can determine if a product has been in the wrong place or has been in one place for too long. This is especially important for refrigerated items that cannot be stored in a warm environment. (Kshetri, 2018)

Over the last several years many companies have been investing in the development of the Blockchain technology. Such an impressive potential of this technology has motivated them to imply Blockchain for their companies’ operations. There are some of existing applications of the technology presented below with the examples.

Financial Applications

Currencies - Digital currencies, such as Bitcoin, were the first to apply block-chain technology, which allowed to fully decentralize the emission of currencies and track payments. Following the growing success of Bitcoin, a large number of digital currencies have been created, which are variations of the Bitcoin system architecture.

Exchange - The Blockchain can be used to create decentralized systems that facilitate the exchange of digital currencies such as Bitcoin or any other type of asset that can be registered on the network with its own digital identifier. Companies such as Coinbase, ItBit or Kraken are examples of current digital currency exchange systems.

Social applications

Digital Identification - Blockchain technology can provide the infrastructure to scale digital identity at an exceptionally low cost and significantly increase security. Instead of various governments issuing identity cards or passports to citizens, a decentralized identification service using block-chain technology could provide users globally with the opportunity to get their own digital identity through a decentralized system. This application has attracted the attention of many government organizations.

Voting - Blockchain technology can be used to authenticate the voting process with "private keys" for each voter. With this application it is possible to create a system log to verify the identity of users, but to keep them anonymous when calculating the final result of voting in real time. Because the protocol is transparent, voters can be assured that the results are correct and not subject to manipulation or fraud.

Legal applications

Intelligent contracts - Intelligent contracts based on block circuits are a new case of using block circuit technology. The idea of intellectual contracts is relatively simple: software protocol performs an action (releases funds, sends information, makes a purchase, etc.) under certain conditions (payment is received, the result of the event is determined, etc.). The advantage of block chain based contracts is that they reduce the amount of human involvement required to create, execute and enforce a contract, thereby reducing costs while improving the security of execution and enforcement processes.

Intellectual property - The general concept of intellectual contracts is the idea of managing all property in blockchain models. Digital identifiers can be created for any hard resource in the physical world represented in the block chain system. With the help of these personalities it is possible to manage the property with the help of intelligent contracts, for example, the door of a hotel room can be automatically unlocked when the user accepts the payment, or a car that does not allow the user to drive the car at the end of its insurance period.

Other possible applications

Asset Tracking - Block Chains can be used to track physical assets, so that property can be proven for each asset. For example, Everledger is a company that tracks diamonds, creating a digital identification for each diamond in a block chain network.

Technical Applications - Complex technical systems are seen as the next potential application of block chain technology. The authors suggest a number of engineering transactions that can benefit directly from a block-chain approach. These include: control of financial transactions between and within companies, tracking of assets and products during and after production, quality control and testing, distributed modular designs for machines and systems, and the production supply chain. (Abeyratne and Monfared, 2016)

Despite the all the potentials and bright sides of blockchain technology, it also has several challenges and limitations to overcome.

First of all, the global supply chain is functioning in a compound environment that requires numerous parties to comply with various laws, regulations and institutions. They include maritime laws and regulations, commercial codes, laws pertaining to ownership and possession of multiple jurisdictions in the shipping routes. Since international businesses operate against the framework of these established old laws, customs and institutions that are managed by human beings, implementing blockchain-based solutions can be a tremendously complicated task.

Second, implementation of blockchain consists of bringing all the relevant parties together, which can be a difficult undertaking in many cases. Everledger Founder and CEO Leanne Kemp noted that it took about 18 months to negotiate the relationships needed to make the Everledger service possible.

Third challenge is related to fraudulent and manipulative activities which might potentially happen when using blockchain. This technology can provide strong tools to make sure that the signatures are in order, the ownership information is updated, and the inspections have been done, but at the same time the boundaries between physical and virtual realms of blockchain will remain lawless in a way.

Fourth, some technologists who support Bitcoin think that the newer, corporate-designed blockchains lack one of the main elements that made Bitcoin a success: the decentralized structure. For instance, anyone in the world is able to join Bitcoin and study the ledgers. On the other hand, only a limited set of participants can have access to blockchain system like that of IBM. This feature can make such system more vulnerable to attack.

Fifth, due to the requirement of high degree of computerization, not all countries are ready to participate in blockchain-based solutions. Many supply chain partners located in developing and least developed countries often are far from ready to adopt blockchain. Without their participation it is difficult to realize the full potential of blockchain in supply chain. (Kshetri, 2018, p. 88)

References

Abeyratne, S.A. and Monfared, R.P. (2016), “Blockchain ready manufacturing supply chain using distributed ledger”, *International Journal of Research in Engineering and Technology*, Vol. 5 No. 9, pp. 1–10.

Francisco, K. and Swanson, D. (2018), “The supply chain has no clothes: Technology adoption of blockchain for supply chain transparency”, *Logistics*, Vol. 2 No. 1, p. 2.

Kshetri, N. (2018), “1 Blockchain’s roles in meeting key supply chain management objectives”, *International Journal of Information Management*, Vol. 39, pp. 80–89.