Cognishen Focus

Blockchain technology in SCM

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In the past year, we have discussed digital supply chains, smart factories, and Industry 4.0. Let us now explore some of the innovative technologies that are either being used or trending to be in use with respect to supply chain management. One such technology is blockchain. In this newsletter, we will explore blockchain technology and how supply chain management benefits from this technology.

Blockchain Technology

Blockchain technology is a method of recording vital information of a transaction or a process or a system in such a way that it is impossible to change or manipulate the recorded information.

A blockchain is a well-known example of a distributed ledger technology (DLT). A ledger is a permanent summary of recorded transactions that are recorded by date. A DLT system records transactions and their details in multiple places at the same time. This is different from traditional databases in the sense that distributed ledgers have no central data store or administration functionality. DLT works on a computer network spread over multiple entities, locations, or nodes. DLT uses ledgers stored on separate, connected devices in a network to ensure data accuracy and security. Blockchains evolved from distributed ledgers to address growing concerns that too many third parties are involved in too many transactions. A blockchain is a distributed ledger that duplicates and distributes transactions across the network of computers participating in the blockchain.

The name blockchain was coined for the way the technology stores transaction data — in blocks that are linked together to form a chain. Blocks record and confirm the time and sequence of transactions that are logged within a discrete network governed by rules agreed on a priori by the network participants. Each block contains a hash, a digital fingerprint. The hash of the previous block is linked to the next and this arrangement prevents any block from being altered and is immutable. Every transaction in this ledger is authorized by the digital signature of the owner, which authenticates the transaction and safeguards it from tampering. Therefore, the information in the digital ledger is highly secure. A blockchain is an incorruptible digital ledger of transactions, not just financial transactions, but virtually everything of value with trust using the secure transaction as a key element. In other words, anybody can see the data, but no one can corrupt it.

A new transaction

The new transaction is transmitted to a network of peer-to-peer computers scattered across the world and the transaction is validated.

Once validated as legitimate transaction, the new transaction is recorded as a block that contains a hash, a digital fingerprint. The hash of the previous block is linked to the next and this arrangement prevents any block from being altered and is immutable.

Blockchain Technology and Supply Chain Management

In a recent survey of almost 3,000 global C-suite executives, IBM found 33 percent of organizations, on average, across all industries and regions, are already considering or actively engaged with Blockchains[1]. Some organizations that are already experimenting with blockchain technology or others who are implementing blockchains are finding that blockchain technology is likely to radically change how their organizations operate, generate revenues, and respond to customers, partners, and competitors alike[1].

Practical Insight

SCM Blockchain @ Walmart

"In August 2017, Walmart announced a partnership to use blockchain with Dole, Kroger, McCormick, Nestlé, Tyson Foods, and Unilever. This is to collaborate and find new applications that could help increase food traceability. By September 2018, it was possible for Walmart to trace over 25 products from as many as five different suppliers. Some of the products were mangoes, leafy greens, strawberries, dairy products, meat and poultry, packaged salads, and baby food. The system was so efficient that one could take a jar of a product or a salad box and trace the ingredients back to the farms from where they were harvested.

Walmart boasted a new, blockchain-enabled food traceability initiative to increase transparency in the food system and create shared value for the entire leafy green farm to table continuum.

The same year, the company piloted a Blockchain technology for the end-to-end traceability of shrimp sourced in Andhra Pradesh, India, and shipped to select Sam's Club locations in the USA. This was the first-ever known use of Blockchain supply chain technology to track shrimp exports from farms to overseas retailers."

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There are two important attributes of supply chain management that are associated with blockchain technology including supply chain contracts and reverse logistics[2]. Let us discuss the impact of blockchain technology on those two attributes.

Supply Chain Contracts

Smart contracts as computerized transaction protocols that execute the terms of a contract in a supply chain. Supply chain management (SCM) can be defined as activities that integrate and manage the sourcing, flow, and control of materials across multiple tiers of suppliers. The intent of supply chain management is to provide and facilitate collaboration between buyers and suppliers with respect to the flows of goods, services, and information. The corresponding financial resources are eventually summarized into enforceable contracts between the two parties. While the trust and the enforceability of the contracts form the foundation of effective supply chain management, information asymmetry between the parties and the related agency costs for monitoring and assurance function require significant resource from both parties. Blockchain technology as an enabler of smart contracts enhances the concern of increasing transaction costs along the supply chain. Such contracts become a social form of trust through transparency fulfilling a historical model of a social contract without the potential or need for enforcement by a government or a certified authority. Once supplier arrangements and customizations are in place, buyer firms can use blockchain technologies effectively to procure input materials that would serve customer requirements better. The rich communication enabled by blockchain allows firms to transmit features, specifications, and requirements much more succinctly and accurately to suppliers.

Smart contracts can be used to optimize the global supply chain for buyers, suppliers, and other stakeholders in the supply chain. Suppliers and buyers normally have different and conflicting objectives. For example, suppliers want buyers to commit themselves to purchasing large quantities of products in stable volumes with flexible delivery dates. Conversely, buyers need to be flexible to their customers' needs and changing demands. The difficulty with global optimizations is that they require decision-making power to an unbiased decision maker. Using blockchain technology, buyers and suppliers can design supply contracts to maximize profit on the supply chain with more visibility into demand, inventory, and upstream/downstream operations through a trusted and secure network. Additionally, interactions and agreements can be saved automatically with a traceable record.

Reverse Logistics

The forward chain involves traditional conditions purchasing from suppliers, producing products, and distribution to end customers. Reverse logistics is anything that goes the opposite way of the traditional forward supply chain in the form of returns. Reverse logistics is the process of returning products from end users back through the supply chain to either the retailer or manufacturer. This is an important part of supply chain management.

Reverse logistics and their associated activities result in additional costs in the supply chain when compared to forward logistics regardless of the additional potential associated revenue. Reverse logistics can have varying levels of difficulty with associated costs based on the products involved and their use. Recalls, warranty, end-of-use, end-of-life returns, customer preferences, and customer satisfaction are all part of reverse logistics. Blockchain technology can be an enabler of a closed-loop supply chain and reverse logistics. Blockchain technology, with its inexpensive investments, can improve the entire logistics workflow for all parties involved in the logistics process including small companies. It can improve information flow fulfilling privacy, transparency, and trust requirements. However, the positive impact of decreased transactional costs and customer trust afforded by blockchain are magnified in reverse logistics over traditional forward chain logistics.

References:

[1]IBM (2017). Forward together: Three ways Blockchain explorers chart a new direction. IBM Institute for Business Value. Armonk, NY: IBM.

[2]Breese, J., Park, S., & Vaidyanathan, G. (2019). Cybersecurity in Blockchain Technology: A Theoretical Perspective of Two Key Supply Chain Management Factors. Issues in Information Systems, 20(2), 140-150.

Tech Briefs

Blockchain and ERP

"Blockchain networks can be connected to ERP systems within and outside an organization to facilitate information and transaction sharing across enterprises. As a transparent and decentralized platform, blockchain can complement and simplify supply chain operations by enabling connected supply chains that share information across all transactions.

While ERP systems provide some visibility, they are not in real time and is not across all stakeholders. The main reason for this is that ERP systems are not connected with each other and confined to an enterprise. There are a number of reports shared today across suppliers, manufacturer, and distributor like Point of Sale (POS) report, Product Transfer and Resale Report, Availability report, Planning and Shipping schedules, etc., which are time consuming and asynchronized."

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Email: info@cognishen.com

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