



BlockChain for Business

Building Trusted Supply Chains

BlockChain

Simply defined, BlockChain is a Decentralized Ledger System that creates a permanent (Immutable) and shared registry of every transaction, associated with any type of Asset (Tangible & Intangible). Every Transaction is Time Stamped, put into a Block and is appended to the Block before it. Due to the decentralized nature, data inside a Block is validated and appended by a common Consensus achieved by all (or some) of the participating parties, which makes the record Trustworthy, Transparent and Secure.

BlockChain is groundbreaking and has the potential to disrupt every business today, which involves transactions across multiple parties. This paper is intended to discuss the positive impact of BlockChain on Supply Chain.

While the technology underpinning BlockChain was introduced to the world in 2008, via Satoshi Nakamoto's whitepaper around BitCoin, which is the current and most prevalent cryptocurrency (Digital Cash), yet the first contribution towards the usage of cryptographic proof of computational expenditure, a.k.a. "Proof-Of-Work", was provided by Dwork and Naor in 1992.

Supply Chain

The process of passing material(s) forward to meet a customer demand, is the essence of Supply Chain. This process involves partners who manufacture raw materials, components, assemblers, shippers, wholesalers and retailers, to ensure the productization and availability of any product to the consumer, on time, every time.

Traditionally, this process is based on Negotiations (across multiple parties), Verification (of the authenticity of the raw materials/components), ensuring Trust in the assembly lines or manufacturing partner and delivery & transportation schedules. The whole aspect of Forecasting the demand, on top also adds a new level of complexity in the process.

Despite making process improvements, organizations today still face challenges like:

- Lack of Trust
- Anxiety of delivery timelines
- Reliability of components (sometimes we see the "Recall Notices")
- Forecasting Support needs (attributed sometimes by obsolescence of components)
- Confidentiality of Information

In a scenario when goods are in transit, absence of comprehensive and real-time data can be a definitive impairment towards the efficiency of supply chains.

Trust in a Democratic way

In a typical supply chain process, issues around Trust occur due to differences in the interests of the multiple parties involved. More often, these contentions are resolved by Central authorities like Banks, Legal Houses or Clearing authorities. Even though a third-party arbitration is the only sensible option, yet there cannot be a definitive conclusion that the verdict could never be biased via any malpractice.

Implementation of Smart Contracts guarantees trust, without having to involve a human. A smart contract is a computer program that runs on Blockchain which simply believes on the fundamental of "If THIS, then THAT", purely based on a specific business logic. Smart Contracts are self-executing, self-sufficient and do not need an administrator, thereby replacing legacy systems which involve Authority, and Anxiety around processes and systems defined by others.

Central Authorities are replaced by the peer-peer networks, which work in a democratic fashion called Consensus. Every new change in the information (transactions) is broadcasted to all the nodes (Business Partners) in the network. Each node collects the new transaction and verifies the "Proof-Of-Work", upon which the Block is shared (broadcasted) to the other nodes, which afterwards express their acceptance. Hence, none of the parties involved can either unilaterally change, or defy the information and break the rules of the system, thus increasing the Trustability of the system.

The 2017 Edelman trust barometer discovered that trust in institutions like NGOs & corporations has declined in 2016 to trust "lows" similar to trust levels during the financial crisis. 85% of respondents indicated that do not "trust the system". And only 52% of the respondents trust in businesses.

-Edelman 2017

A Smart Contract should not be confused with traditional legal contract. It is rather a Business Logic implemented via software. For example, in the current discussion, Smart Contract can be implemented to ensure payment to the shipper, IF the shipment arrives on time and with the correct quantity. The contract once entered is irrevocable and WILL be implemented.

Transparency

Provenance and Authenticity along with real time visibility is key to a successful Supply Chain, which is a real contribution from BlockChain.

Even with best practices and hardened processes, companies today face with basic questions. Are our electronic components not counterfeit, and how do we verify that? Did the warehouse receive the complete order from the supplier? Did the shipper ship everything on time? Assets can be visualized in real time with BlockChain all the way till their point of origin, with chronological timestamps.

Every business partner (component manufactures, shipper, factory etc.) participating in the Supply Chain BlockChain can append the registry of transactions, reach on consensus, and access the registry as well (depending on the implementation of BlockChain), which enables them to gain real time visibility. Smart Contracts can then implement the required business logic to enforce the journey based on predetermined criteria.

This implementation enables organizations to become nimble. The real-time visibility provides a feedback mechanism for course correction or optimization instantaneously. Basic problems like parts not being available on time, can enable organizations to instantly decide upon their pricing and distribution strategies. Further, visibility into the same issue of parts shortage, can help the shipper to adjust the size of their containers thereby reducing cost. The chronological time stamped history can inform the buyer about the provenance and hence help them to avoid counterfeit components. Coupled with IOT (Internet Of Things), theft of the components can be avoided during the shipment, Or a payment can be instantly be settled (based on a Smart Contract) to a shipper, once the sensor detects the container with the right quantity, arriving at the destination.

As the consumers can also track the provenance, it yields a competitive advantage to organizations deploying BlockChain. Business Operation standards for every party involved will constantly evolve and improve, since everyone till the end consumer becomes aware of it.

Participation in a typical BlockChain can be in two modes: *Permissionless* or *Permissioned*. Consensus is reached based on the mode implemented.

In a *Permissioned* mode (as in Ethereum), all parties (business partners) have access to all the transaction registry and everyone (regardless of whether the partner contributed to any transaction) participates in establishing the Consensus.

In a *Permissioned* mode (as in HyperLedger Fabric or R3 Corda), specific parties are pre-selected for specific transactions and only those parties can participate in establishing the Consensus.

Forecasting

The most classical, yet the most important aspect of a robust Supply Chain is to gain accuracy in projecting the demand.

While organizations constantly research and implement best practices around it, yet unavailability of correct data, from the right source at the right time hinders their ability to forecast with better accuracy. Data like the change in inventory of a specific product from a specific retailer, in real-time can provide much insight. This information is not only vital for the manufacturers, but also help the component manufacturer and shipper.

BlockChain disrupts this aspect not only from the perspective of availability of new data, but also from the aspect of bringing a partnership ecosystem of forecasting. Organizations can now engage into joint forecasting sessions with their business partners to insert efficiency. Environmental and geo-political data can also be inserted to better the forecasting view.

Basic queries:

- Are there central authorities involved to ensure trust?
- Am I getting the right data from right source at right time?
- Am I late in collating data from all my business partners?
- Even if a new supplier has quality products, Can I trust him?
- Can I get business advantage if I instill confidence in my consumer about the whole process?
- Can I switch partners in the middle?

Trade Finances

Implementation of Smart Contracts and Digital Unique IDs streamline the compliance procedures. Funding institutions can now approve funding at a much faster pace and in a more secured and trusted fashion; “CreditWorthiness” can be quickly established as banks can access the data on collaterals in a secured and real-time way, tracking the true value and provenance of the asset since its birth.

For international trade, issues of Exchange rates can also be solved by automatically implementing the published rate at the time of delivery, via a Smart Contract. As payments are recorded in the BlockChain, these will eliminate any ambiguity, probability of dispute and the classical issue of “Double Spend”.

Lastly, the manual and laborious process of issuance of “Letter of Credit” can be streamlined. Today, it involves paperwork & multiple banks representing multiple parties. BlockChain will provide a trusted record, that will act as the (shared) source of truth, providing the right orchestration to automate the process with security and trust.

Author

Anirban Chakraborty

Principal, Moonlight Capital

Sr. Advisor, B12 Consulting

Sr. Advisor, ThirdEye Inc.

Anirban@B12Consulting.com

Anirban@Thirdeyeinc.com

Info@B12Consulting.com

+1.972.361.8434

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