REVOLUTIONIZING LOGISTICS AND TRANSPORTATION THROUGH BLOCKCHAIN

With the sheer pace of globalization and the rise of e-commerce and other factors contributing to the cause, the global economy has become more integrated and interconnected. However, one critical aspect which has facilitated in the burgeoning rise of the integration of the world economy is the globalization of the logistics that links trade and commerce. A simple principle of trust among the various stakeholders has been the binding thread in the incredibly complex supply chain. However, the advent of blockchain technology in the supply chain is bound to have a disruptive and transformative impact. There are umpteen number of opportunities that the blockchain presents in the logistics industry in particular. In this white paper, we broadly look at the existing challenges that have plagued our convoluted supply chain and how Blockchain can help to address it.

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Overview

Enterprise Resource Planning (ERP) softwares have brought in visibility and accountability in operations through centralization for the majority of the world's leading companies. In the context of modern integrated supply chains, logistics and transportation serve as the lifelines often defining the efficiency and effectiveness of the companies' operations. However, globalization of trade over the last three decades have resulted in increasing complexity of the logistics networks involving a multitude of players including – truckers, brokers, freight forwarding agencies, insurers, banks, ports, customs and tax authorities. Thus, with this magnitude and complexity, the challenges faced by the logistics and transportation sector today are many and it needs to be addressed comprehensively. Technology is one of the key factors which can define the success of the future logistics network and blockchain promises to be once such technology. In the following sections, we will take a holistic look at the challenges faced by companies with respect to logistics and transportation. We will also take a look at how blockchain can alleviate many of these persisting issues of the logistics sector by creating the right amount of transformative disruption to establish for cohesive synchronization amongst various stakeholders of the supply chain. In fact, according to industry estimates, it is believed that blockchain will disrupt 88 percent of the industry[1].

Challenges in the existing logistics and transportation networks

Transportation networks have become inexorably complex owing to various factors – size of area served, modes of transportation, tax structures and the large number of stakeholders involved in its functioning which has come along with globalization. Additionally, there is great disparity in the technology adoption levels across the globe when it comes to logistics and transportation and the persistence of legacy paper based system among the developing economies has not helped the cause. Such factors have aggravated the complexity of the supply chains as a whole instead of bridging the gap. Some of the prime issues that plague today's logistics and transportation sector are enumerated below:

- **Visibility and traceability** - The lack of visibility of in transit inventory is one of the greatest pain point that global supply chain leaders face today. Loss of visibility and traceability of in-transit goods can have multiple repercussions for the companies. With most companies following lean principles, there is an increased focus on reducing inventory costs and lack of visibility could mean higher in transit inventory which can in turn lead to higher inventory costs. Another issue which today's companies face are security concerns because of the global nature of trade and with numerous parties involved. Thus, it becomes imperative for businesses to have complete visibility of the goods which change hands numerous times before reaching its destination. Damage and theft of goods are persisting concerns leading to increased costs. According to an industry survey, as much as 54 percent of third party logistics (3PL) providers said they lost businesses due to visibility issues[2]. An estimation by World Health Organizations suggests that degradation of up to 40 percent shipped vaccines took place because of the temperature variations during the transportation[3].

- **Escalating costs** – With global population set to rise from 7.5 billion to 10.6 billion in 2050, the volume of goods transported is set to quadruple according to estimates[4]. And with companies following a lean strategy with low inventory levels, it becomes highly imperative for companies to employ cheap modes of transport to meet the demand at affordable prices. Yet, logistics costs alone have increased by 14 percent[5] since 2013. This can be attributed primarily to rising prices of oil in the international market, increase in wages and lack of skilled truck drivers. Yet, in developing economies like India, where logistics contribute 13 to 14 percent of the GDP, 30 to 40 percent of the costs are attributed to indirect costs associated with theft, damages and inventory carrying costs[6]. This coupled with the rapid pace of urbanization is expected to increase congestion further leading to increase in cost due to congestion by as much as 40 to 50 percent by 2030[7]. The ever increasing cost of transportation coupled with unpredictability is causing immense losses in value to various companies.

- **Poor Data Management** – Poor data collection and management across the logistics and transportation network is another key issue that has eroded value from the supply chain. One of the greatest challenges is the fragmentation of data. There are numerous stakeholders in the logistics industry which includes suppliers, shipping companies, warehouses, 3PL players and last mile delivery services provider. Each of the players have different record keeping standards and has visibility of data over only a portion of the process. In essence this means that single version of truth doesn't exist over the logistics network. According to an industry study it is estimated that better data management can lead to savings to the tune of 15 to 20 percent of transportation costs by using data and advanced analytical techniques

- **Trust Issues and Disputes** – Transportation and Logistics sector has traditionally been very competitive where participants are reluctant to share information. Thus, most of the information sharing has been based on trust and relationships that have been forged over time and participants are reluctant to share any information beyond these established relationships. Thus, disputes and conflicts are daily occurrences in the fragmented logistics industry due to the information asymmetry. Furthermore, these issues lead to delay in payment, extended delivery duration and other inconveniences. Therefore, expedited settlement claims are the need of the hour in the present context in the supply chain.

- **Poor Asset Utilization** – Transportation and logistics are becoming ever more inefficient as truck fill continues to shrink. This is primarily attributed to companies preferring lower inventory levels, fragmentation of the trucking industry and customers ordering smaller shipments. An average truck runs at 60 percent of the full truck load capacity (FTL)[7], according to the U.S. Department of Transportation. The figures are similar in case of Western Europe as well due to trucks returning from journeys empty or only partially full[8]. This unused capacity cost the Western European industry about €100 billion, a significant amount considering that industry sales were €300 billion and its profit was approximately €10 billion. In at least one out of every four or five trips the trailer is completely empty which means that overall efficiency rates are never greater than 50 percent[7].

Benefits of blockchain

Blockchain technology possess the tremendous capability to bring sweeping changes across in almost every aspect of logistics and transportation. It has the potential to enhance operational efficiency across the entire logistics spectrum. It promises to fundamentally change the way data is viewed, exchanged and interpreted within logistics and transportation industry there by changing the way the industry works. It also promises to augment trust and security within the global supply chain ecosystem. The are many ways in which the transformative power of blockchain can be harnessed. Below is the list of some key benefits which can be leveraged with the help of blockchain.

- **Improving transparency and traceability** – Blockchain provides unprecedented traceability. This will help to alleviate traceability and transparency issues across the logistics and transportation industry (and the whole supply chain at large) allowing organizations to make informed decisions. The product information is stored in the blockchain-based system makes the data permanent and easily sharable, giving supply chain players comprehensive track-and-trace capabilities. Companies can use this information to provide proof of legitimacy for products, for instance in case of pharmaceutical shipments or proof of authenticity for luxury goods. In this context, De Beers Group uses the blockchain based platform Tracr to trace and track the diamonds thereby authenticating a diamond's natural creation, provenance, and ethical sourcing. Tracr thus helps to create trust among the various industry stakeholders and confidence in end-to-end traceability of a diamond and also facilitates in logistics activities like customs clearances.

- **Increased efficiency and reduce costs by combining blockchain and IoT** – It is estimated that 90 percent of the world freight moving though the global shipping lanes. But there are immense complexities involved in the global shipping processes, with multiple stakeholders with varying conflicting interests. For example, a shipment of refrigerated goods from East Africa to Europe goes through nearly 30 people and organizations, with more than 200 different interactions and communications among these parties[9]. Thus, it becomes imperative to streamline the processes as much as possible to increase efficiency. Implementation of blockchain technology promises to alleviate many such frictions in global trade logistics including procurement, transportation management, track

and trace, customs collaboration, and trade finance. Maersk is implementing a global blockchain-based system for digitizing trade workflows which will allow end-to-end shipment tracking. This system allows each stakeholder to view the progress of goods during transit and also see the status of customs documents, bills of lading and other data. Blockchain technology ensures secure data exchange and a tamper-proof repository for such documentation. Similarly, Swiss firm SkyCell with the help of blockchain backed by IoT devices that allows able air freight containers for temperature sensitive pharmaceuticals to smartly analyzes temperature, humidity and the location. SkyCell's platform also records documentation like bills of loading and customs forms for each container on a blockchain-like ledger, providing supply chain visibility and security that complements the container's temperature security. This helps to reduce the wastage of pharma products due to temperature issues.

- **Smart Contracts in Logistics** – Smart contract is a blockchain based application which ensures accountability of various stakeholders in the logistics ecosystem. Smart contracts are components of a blockchain-based system that enforce stakeholder pre-agreed and established rules of transactions and process. Furthermore, smart contracts expedite custom clearances and approvals, reduces complex paper work, and builds trust and security among the stakeholders by enforcing compliances to the already established and agreed rules of transactions. ShipChain is a startup working in this direction. The company has designed a system based on blockchain that can track a product right through its entire journey; from the factory to the customer's doorstep. Relevant supply chain data is recorded in the unalterable blockchain-powered database which can trigger smart contracts upon fulfilment of the requisite terms and conditions of the transaction. The Bank of America Merrill Lynch (BofAML), HSBC and the Infocomm Development Authority of Singapore (IDA) have developed a prototype which will bring the paper-intensive Letter of Credit process onto a blockchain based platform.

- **Data transparency, visibility and accountability unlocking value in logistics** – Blockchain technology possess the mechanism to store and record the accurate tamper proof data which. This ensures a single version of truth for the transaction even with multiple stakeholders' involvement. In the fragmented, multimodal and complex logistics networks of today which with conflicting interests of the various players, this would dramatically reduce lead times, costs due to damages and delays as well as human errors. In this context, ocean carrier company ZIM has piloted a blockchain based digital bill of lading. Industrywide adoption of such systems would significantly reduce costs, enable error-free documentation and fast transfer of original documents. Similarly, Walmart has tested a blockchain based system designed to trace the origin and care of food products such as pork from China and mangoes from Mexico where it has documented the origin as well as in transit conditions of the products' journeys from farm to store. This potentially can reduce losses due to contamination or rotting of such perishable products there by adding value to companies' operations.

Avenues to success for blockchain in logistics and transportation

While the early benefits of implementing blockchain in logistics look promising for all the stakeholders, yet there exists huge gaps and barriers which need to be overcome. Even if such systems are introduced, there are multiple factors which contribute to the success of them in particular and creating value at large. Some of such factors are discussed here:

- **Creating compelling value propositions for all players** – It is imperative to define the value propositions for each of the participants in the ecosystem. Stakeholders involved in the blockchain-based initiatives must be clearly able visualize how participating in it will unlock value for them as well as across the whole ecosystem. While identifying potential blockchain use cases, companies must thoroughly brainstorm and scrutinize each idea to establish its dependency on blockchain technology. For this, they must be able to prove and understand the businesses as they are currently and value of a new initiative, as well as establish technical feasibility after carefully considering the challenges.

- **Create a culture of partnership and collaboration** – The realization of the potential value creation cannot be done in silos and must involve all stakeholders. For this, it is necessary to foster an intensive culture of partnership and collaboration based on trust. Companies have realized this and as such five container shipping players—CMA CGM, Maersk, Hapag-Lloyd, MSC, and Ocean Network Express— are in the process of creating a not-for-profit association aimed at promoting digitalization, standardization, and interoperability in their industry. Such, collaborative efforts include establishing common IT standards that will be available without charge to all industry stakeholders.

- **Governance and Standards** – Stakeholders have to define the standards and governance required for creating the ecosystem in terms of policies, technical elements and governance while keeping in view the commercial aspects. Policies clearly need to address regulatory considerations, such as laws, international privacy standards, and requirements for data sharing as well as security aspects by creating frameworks and rules. While considering the technical elements, stakeholders must define how the participants can reach consensus when recording transactions on the blockchain, type of blockchain to be used and data model that will correspond to the models of the existing systems used by different participants. Governance

and rights must be clearly established to articulate and govern the roles and decision rights of every stakeholder in the ecosystem. In this regard, the first movers and early adopters play a critical role in establishing the appropriate governance, which gives them greater influence over the ecosystem's future development. Lastly, all the decisions need to be taken based on the commercial considerations including costs of designing, implementing, operating, and maintaining the solution and how the costs will be shared among stakeholders.

- **Build knowledge and competence** – Blockchain being an inherently complex technology, it is important to build knowledge among the stakeholders. Small solutions and prototypes built with partnerships with IT firms will create the knowledge and capabilities, thereby enabling organizations to identify and realize the value of new operating models and opportunities to scale up the solutions. Thus, it is required that the contributors liaise effectively within the blockchain ecosystem and with relevant technology players, implementation partners, and associations and build on the successes and failures to create a fledgling blockchain based logistics ecosystem.

Conclusion

Adoption and implementation of blockchain technology in the logistics and supply chain will lead to a paradigm shift unlocking untapped value. This will primarily help organizations to –

- Improve transparency and traceability thereby build trust and eliminate issues related to sustainability and ethical sourcing
- Increase the efficiency and reduce costs through combination of blockchain with other technologies like IoT
- Implementation of Smart Contracts in Logistics will help build trust, reduce losses and streamline the logistics handling processes
- Bring in data transparency, visibility and accountability which will help in unlocking value in logistics and supply chain at large

Already many companies across the spectrum are realizing the utility of blockchain and how it can help to streamline their logistics operations and create value in the supply chains. For growth of the blockchain based ecosystem, it is immensely important to –

- Create compelling value propositions for the stakeholders
- Forge partnerships and collaborations among the partners
- Create and enact governance standards
- Build knowledge and competence

The wider acceptance of blockchain across the spectrum will certainly ease the physical flow of goods and create more harmony within the logistics network through seamless flow of one single version of the information. In short, blockchain technology can prove to be an absolute game changer for a better, smarter and more secure supply chain networks at large and logistics operations in particular.

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