

BLOCKCHAIN TECHNOLOGY: A WAY FORWARD IN DIGITALIZATION OF PORTS IN INDIA
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Abstract

The use of blockchain technology and its applications in various areas is a form of disruptive technology changing the way operations are carried out. Since its inception in the year 2008, it took only a decade's time to cover maximum functional areas of national as well as international importance. Global trade is no exception to it. Ports play a crucial role in shipment of goods and services across the national borders. Both seaports and dry ports (Inland Container Depot in this case) are important in the movement of cargo from exporter's warehouse to importer's warehouse. To manage all the logistics and Supply chain activities in an integrated manner in the modern era, use of technology has become an inevitable choice. Various systems and techniques have streamlined this process. The paper focusses on the application of blockchain technology in providing end-to-end logistics solution to the various stakeholders involved in international trade in India through an App based model. Functionality of the App is enhanced by integrating a blockchain model for providing a secure, transparent, verified and real time information about the container in transit. The paper highlights the procedure followed by the importer in getting the goods transported to a destined location. The researchers have proposed suggestions for increasing the scope of use of blockchain technology and a model to integrate all the activities under the roof of international trade. Finally, the researchers have tried to outline the other technological systems and applications that can be used to enhance the logistics and supply chain systems in Future for bringing in transparency and interoperability in international trading scenario in India.

Keywords: Blockchain technology, Inland Container Depot, Logistics.

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Introduction:

The Global trade has seen a sharp spike recently while it recovered from the COVID-19 pandemic. No economy in the world has remained immune from digitalization in this new era. Digitalization of many sectors in various industries have been accelerated and using new age technologies such as IoT, machine learning, big data, artificial technology, etc. has

become a common phenomenon.

Blockchain technology and its application has been a point of argument for many international organisations. World Customs Organization had already made an effort to identify and understand the possible uses and applications of blockchain technology for improving compliance, trade facilitation and fraud detection across the various Customs organization all over the

world.¹ Along with the World Customs Organization (WCO), World Trade Organisation has also repeatedly focused on the use of blockchain technologies through its various reports. An optimistic view has been presented by many Customs Organisations all over the world regarding the use of blockchain technologies for achieving greater efficiency and reliability in risk management, revenue collection and trade facilitation.² The blockchain technology can be used primarily for 2 purposes in the international trade. They are :

1. Track and trace (in supply chain management)
2. The digitalization of trade procedures (trade finance, cross-border payments management, customs and tariff management, trade compliance and risk management)³

Many countries in the world have established models based on the blockchain technology primarily for tracking and tracing function as their pilot project. The blockchain projects are very important to carry out port operations, maintain hinterland connectivity and support the intermodal transportation systems. The tracking of cargo movement from the exporter's point of departure to the importer's warehouse has a profound impact in assuring trust ability, traceability, immutability, secure connections, visibility of the operational data, reliability and interoperability for cross- border trade facilitation. All these objectives can be fulfilled by using blockchain technology in international trade.

What is Blockchain?

Blockchain technology and Digital Ledger Technology are often used as synonyms. But in reality, Blockchain is a type of Digital Ledger Technology which is functional in many areas all over the world. Blockchain is a de-centralized, distributed record or ledger which is tamper- proof and mostly inalterable. It uses cryptographic techniques for logging and storing the data. It is a peer-to-peer network and highly secure for making transactions across the online platform. No single party can control the whole network. Using blockchain technology ensures authentication as well. It enables the access to information on a 24X7 basis.

Blockchain-based platforms are of three types, i.e., private, public, and consortium. A private blockchain based platform is restricted to use only by authorized peers in the network involved in transactions. It is permissioned and restricts the usage and access to non-authorized persons. A public blockchain can be accessed by anyone at any given point of point. It does not have any control mechanism for the access of data in the network. It can be of two types: permissioned and permissionless. A consortium is a combination wherein no single entity has a control over the network. It works under the leadership of a group. It can also be permissioned and permissionless.⁴ The overview of main characteristics of various types of blockchains can be presented as follows

¹ http://www.wcoomd.org/-/media/wco/public/global/pdf/topics/research/research-paper-series/45_yotaro_okazaki_unveiling_the_potential_of_blockchain_for_customs.pdf?la=en

² https://www.wto.org/english/res_e/booksp_e/wcotech22_e.pdf

³ https://www.wto.org/english/res_e/booksp_e/blockchainanddlt_e.pdf

⁴ https://www.wto.org/english/res_e/booksp_e/blockchainrev18_e.pdf

Decentralization	Public		Consortium		Private
Management	No centralized management		Multiple organizations		Single entity
Access	Permissionless	Permissioned	Permissioned	Permissionless	Permissioned
	Open read/open validation of transactions	Open read/permissioned validation of transactions	Permissioned OR open read/permissioned validation of transactions	Open read/open validation of transactions	Permissioned read/validation of transactions
Participants	Anonymous/pseudonymous	Anonymous/pseudonymous	Identified	Usually identified	Identified
Validation based on consensus protocol	Open to every participant in the network	Open to every participant in the network, subject to certain conditions	By pre-approved participants (across the organizations involved)	Depending on the consensus protocol chosen for the platform	By pre-approved participants (within the single entity)
Speed of validation	Slow	Quicker	Quick	Quick	Quick
Users' level of privacy	None	None	Tailored to the needs of participants	Tailored to the needs of participants	Tailored to the needs of participants
Computing power required (energy consumption)	High (but variable depending on the consensus mechanism)	Intermediate. Variable depending on the consensus mechanism	Lower	Lower	Lower
Transaction fees	Yes	Yes	Optional – depending on the rules of the blockchain	Optional – depending on the rules of the blockchain	Optional – depending on the rules of the blockchain
Scalability	Low	Slightly higher	Higher	Higher	Higher
Example(s)	Proof of Work (Bitcoin, Ethereum)	Proof of Stake (Nxt)	Blockchains built on Hyperledger Fabric. Permissioned blockchains built on Ethereum.	FastTrackTrade	Private blockchains built on Ethereum

Source: WTO report : Can Blockchain revolutionize international trade?⁵

The benefits of using blockchain technology can be listed out as follows:

- Transferability, immutability and accessibility of information

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https://www.wto.org/english/res_e/booksp_e/blockchainrev18_e.pdf

- Lower verification and transaction costs
- Sharing of information amongst all the relevant stakeholders in real time
- Increased availability of information from different sources
- Increased data quality
- Automation through smart contracts
- Data privacy
- Secure IT environment
- Easy to use technology ⁶
- Blockchain technology can be applied by the port authorities and maritime informatics center in the following areas:
 - Shipment tracking and tracing
 - Automation of port terminal operations
 - Protection and safeguarding of trade documentation data
 - Fleet operations management
 - Asset certification ⁷

The paper focusses on applicability and use of blockchain technology in International trading in the Indian scenario. The Indian Ports Association is an apex institution constituted under the Societies Registration Act to foster growth and development of major ports and act as a supervisory control mechanism for all the port operations in India. The Indian Ports Association has been instrumental in digitalizing various procedural norms through its Port Community System (PCS). But it was restricted only to the sea ports. It does not deal with the dry ports/Inland Container Depots which provide hinterland connectivity and form a major part of the logistics and supply chain management when it comes to providing doorstep services / end-to-end services to the importers and exporters.

To strengthen the role of Inland Container Depots (ICD) and bring about much more productive results, the Central Board of Indirect Taxes and Customs (CBIC) under the Ministry of Finance launched a pilot Electronic Cargo Tracking System project at ICD Tughlakabad based on blockchain technology on October 15, 2021. Since then a lot of other changes have taken place which would be elaborated by the authors further.

Objectives:

- To highlight the need to establish and use blockchain technology at ports and major gateways
- To identify the stakeholders involved in providing end-to-end logistics services (in this case warehousing and transit)
- To explain the working of the App based blockchain technology model for efficiently maintaining hinterland connectivity.
- To suggest the ways to enhance communication systems between the ports, inland container depots and various stakeholders involved in the transit process.
- To analyse the various measures to maintain transparency, security and datafication through the use of blockchain technology in an App based model in the Indian scenario.
- To explore the new options developed through the App based model for trade facilitation.
- To elucidate the challenges of using the blockchain model in Indian scenario.
- To recommend on the various new technological options other than App based blockchain technology model for improving trade efficiency and operations in international trading scenario.

Research Methodology: The research objectives are analysed and studied through the case study method

⁶ https://www.wto.org/english/res_e/booksp_e/wcotech22_e.pdf

⁷ <https://doi.org/10.1016/j.rtbm.2021.100620>

adopted by the researchers. Primary data was collected by interviewing the officials at Inland Container Depot of Tughlakabad was conducted by the researchers to understand the working of the Transecur App which is built on blockchain technology model to streamline the warehousing operations of the ICD- Tughlakabad. Secondary data was collected through the various websites, research articles, books, news articles and journals.

AN OVERVIEW OF OPERATIONS HANDLING AT INLAND CONTAINER DEPOT IN TUGHLAKABAD, NEW DELHI THROUGH THE USE OF BLOCKCHAIN TECHNOLOGY:

Inland Container Depot, Tughlakabad (ICD-TKD) was established and commissioned on 1st September, 1993. It is the biggest dry port in India. It is conveniently located having access to all the major roads in Delhi and connecting all the National Highways leading outside the National capital.

ICD-TKD is connected to the major seaports, i.e., Mumbai port, Nhava-Sheva port, Pipavav Port in Gujarat, Chennai port, etc. through the network of full length rail lines. ICD-TKD provides various services through its administrative office set up near Okhla Industrial Area. There are various administrative departments like the Office of Customs, CONCOR department, EXIM cell, CHA, Surveyors, MIS section, etc. It carries out various functions like e-filing of documents, faceless customs clearance, Exim cell and customer cell for seamless service provision, warehousing facility for the consignments, block booking of trains on round trip basis, Electronic Data Interchange (EDI) between Customs and CONCOR, Documentation through the Integrated Container Cargo Logistics System (CCLS), payment of CONCOR dues, refund through ECS, Door to Door stacking of import

loaded containers in stack, Online preparation of EJO and LCL carting order, etc.⁸

ICD-TKD has brought in the use of various technologies and softwares to streamline its procedural formalities. The most recent developments at ICD-TKD includes First Mile Last Mile Connectivity App for providing logistics solutions to the customer and use of blockchain technology to streamline cargo and transportation services through the Transecur app.

Transecur app is used to connect the various stakeholders like the Customs, Inland Container Depots, warehouse keepers, importers and exporters involved in international trade. The ECTS enables the importers to get the delivery of their cargo in a very convenient way by using the Transecur app. A step-by-step procedure to be followed by the importer is explained in detail as follows:

Step 1: The importer needs to file for Bill of Entry in advance according to the arrival date of cargo at the airport/seaport. When the container arrives at the destination, the importer is required to register himself on the Transecur app. There are three categories on the Transecur app through which the registration can be done. They are truck owners, booking agency and the exporter.

Step 2: Once the registration formalities are successfully completed, the importer can file for warehousing facilities at the ICD-TKD by using the Bill of Entry for warehousing⁹ as a mandatory document. The importer must also provide for transit insurance through the app, pay the outercharge and upload the receipt on the Transecur app.

Step 3: After completion of all the formalities, importer notifies Customs authorities about the arrival of container and booking of warehousing space.

Step 4: The Customs authorities after receiving the

⁸ <https://concorindia.co.in/regionlist.aspx>

⁹ <https://www.cbic.gov.in/htdocs-cbec/customs/cs-act/formatted-htmls/cs-regulation>

notification will carry out the inspection formalities of the container.

Step 5: After the Customs authority completes the inspection procedure, it puts an electronic seal on the container. The information regarding the electronic seal is to be logged in by Customs Authorities Official in the system by using the Transecur app. Once the information is correctly logged in by the Customs Authorities Official, the data is locked. The other stakeholders cannot make any changes or modifications in the information entered by the Customs Authorities Official..

Step 6: The container is then transported to the warehouse located at the ICD Tughlakabad. Once a container enters the gate of ICD Tughlakabad, a gate pass is generated online which is uploaded on the Container Cargo Logistics System (CCLS). The MIS section at ICD-TKD will capture this information and store it on their system.

Step 7: The container is finally moved to the warehouse where it is destined to be unloaded. The warehouse keeper will unlock the information through a mechanism installed at ICD-TKD using the electronic seal. He is designated to verify all the information logged in by the Customs Authorities Official and act accordingly further. The cargo would then be unloaded at the warehouse. This cargo is kept at the warehouse in ICD-TKD only until the formalities are completed by the importer and all the duties are paid. If the duties are paid and all the necessary formalities are completed, then goods are allowed to be transferred to a destination as per importer's requirement.

Findings:

- The use of blockchain technology is a pilot project running smoothly and carrying out multiple operations through the Transecur App.
- Once an electronic seal is attached to container, all the stakeholders can locate this container through their login on Transecur App at any given point of

time. The information is secured through the blockchain system. But after the data is locked, it cannot be modified by any of the stakeholders. Tracking and tracing of shipment can be done but modification of data is not allowed. This ensures the security of the data.

- Real time alerts can be received through the Transecur App. This provides an estimate to the importer for further planning and management.
- Authenticity and visibility is enhanced through the App.
- Use of blockchain application built on IBM's Hyperledger Fabric has enhanced the security and protects the data from cybersecurity threats.
- Real time data analytics can be useful in improving the logistical efficiency and providing the ease of end-to-end logistics
- Transecur has further expanded its operations in collaboration with the Govt. of India for monitoring transit of cargo across the national boundaries of Nepal and Bangladesh.
- Transecur has also collaborated with international companies like Maersk, BIPL Singapore, JNPT, CONCOR, Marks and Spencer to name a few for carrying out trade operations across the national boundaries.
- Tracking of cargo movement through the remote places with almost no connectivity is also possible through the Transecur App.
- Total transit time has been reduced from months to a few days.
- Automation of documentation facilities and establishment of digital infrastructure has been possible due to the launch of ECTS.
- Transparency on the part of various regulatory bodies (mainly Customs and Inland Container Depot) is improved as a result of the use of ECTS through Transecur App.
- The limitation arising due to bureaucracy is totally

reduced due to this model.

- The human intervention is minimized in this process which helps in avoiding the human errors.

Recommendations and Suggestions:

- Blockchain technology can further be used to bring more operations under its purview. Currently, it deals only with the warehousing and transit between the sea ports and Inland Container depot to bring about the hinterland connectivity.
- The Port Communication System used at major seaports can also be based on blockchain technology. This will enable utmost security of the data, prevent tampering, promote traceability, trackability and bring about operational efficiency.
- Blockchain technology can be used to promote the small and medium sized enterprises as well. It is very cost effective and the usage is wider.
- Datafication can be conveniently brought about through the use of blockchain technology. Also, trade finance can be automated through the use of blockchain technology.
- For a seamless interaction and interoperable ports logistics system, all the operations need to be digitalized and brought under the wing of blockchain technology but this process is quite slow in Indian scenario.
- The model can be linked to payment systems and wallets for the payment of dues and refund of duties. This can be achieved if ICEGATE is linked to this model. This will lead to a single interface for all the international trading activities. The Customs authorities and other stakeholders can be brought under one roof for simplification of procedural formalities.
- Multimodal logistics infrastructure can be developed using a secure blockchain model.
- The smart contracts in the blockchain technology is one of the important factors to improve the reliability and authenticity of the data stored.

- The Ministry Of Electronics & Information Technology, Government Of India had launched a national strategy on blockchain which has further expanded the scope for the use of blockchain technology in Indian scenario.
- Other technological advancements such as Machine learning, Artificial Intelligence, Internet of things, Data Science, Analytics can be used in collaboration with Blockchain technology to bring about major changes in changing the scenario of Indian ports and converting them to smart ports.
- A regulatory framework should be put in action to enhance and promote the use of blockchain technology by private players as well.

Conclusion:

The paper has outlined the various uses and applications of blockchain technology in the international trading operations. The ports efficiency and operations by using blockchain technology. The blockchain technology model in India is built on IBM's Hyperledger Fabric which is a flexible platform that can facilitate port authority to implement different endorsing and ordering policies for each channel for high business efficiency. The maximum usage of this technology will bring about the best results in operational procedures in International trading. The deployment of blockchain technology is at a very nascent stage and the scope of operations is still narrow. To understand its challenges and backdrops, blockchain technology should be applicable in various sectors at various levels.

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Cite This Article:

Ms. Pawar T.V. and Dr. Mrs. Pimpale V. (2024). *Blockchain Technology: A way forward in digitalization of ports in India*. In *Aarhat Multidisciplinary International Education Research Journal: Vol. XIII (Number I, pp. 13–20)*. **AMIERJ**. <https://doi.org/10.5281/zenodo.10657736>