

The era of Glass Pipes: Blockchain

With clear visibility, real-time traceability and tamper-proof information – Blockchain can not only help our supply-chains and information tunnels in unclogging corruption and fraud but can also improve the flow of carbon accountability. Time to call the plumber?

By Pratima H



The problem with rabbit-holes is, well, they house rabbits or rats or fossils. And it is never easy to navigate a warren. So why have we endured the complexity, obscurity and incorrigibility of closed pipes and elusive tunnels in some industries? For so long!! Where's the light here? Why has no one used some tough and tenacious, but, crystal-clear glass instead of copper, opacity and iron all this while?

Turns out, Blockchain could be that glass we have been looking for - glass that is transparent but also

'not brittle' and 'not so fragile'. What makes it shine? Especially in green shades? And what keeps it under the bubble wrap in some places? Let's follow this pipe.

FROM RUBBER TO COTTON TO PAPER- GLASS IS NOW MORE THAN A VASE

Recently, we saw how India is trying to promote Kasturi cotton as a premium brand from India. As seen at the meeting where the Ministry of Textiles,



If you take an ecosystem approach and combine blockchain with IoT, you can drive even greater transparency into supply chain management.

- **Subramaniam Thirupathi**

Zebra Technologies

the Cotton Corporation of India (CCI), Texprocil and textile industry pushed for Kasturi cotton at the International Cotton Advisory Committee (ICAC) - unlocking various standards to global representatives. It will be a blockchain-enabled cotton that will help in traceability. Just by scanning a QR code of the product, a consumer can trace the supply chain right until ginning and spinning. And as envisaged, when the framework evolves, the system would be able to provide more details of the complete supply chain.

Not far away are attempts in other sectors too. The Indian Rubber Manufacturers Research Institute (IRMRI) and Emertech Innovations Pvt. Ltd. shared about India's first initiative to incorporate blockchain innovations across the rubber sector. This will bring in the verifiability and security of certification credentials and streamline the validation process for skilled professionals.

Raghav Putrevu, Co-founder & Chief Strategy Officer, Natfirst; Founder & CEO, OrangePeople offers many more examples. "Companies like ITC and Walmart India are adopting blockchain, supported by government initiatives such as Telangana's blockchain project for seed traceability. Collaborative platforms, like IBM's partnership with Indian tea producers, are ensuring product authenticity. Andhra Pradesh utilizes blockchain to track farm produce, while Mahindra integrates IoT to track automotive parts in real time. ICICI Bank has implemented blockchain for efficient trade finance, reducing transaction times and costs."



By enhancing traceability, reducing fraud, and improving efficiency, blockchain technology can transform supply chains and sourcing practices, leading to more environmentally sustainable outcomes.

- **Padmakumar Nair**, CEO and Co-Founder of Ennoventure, Inc.

India seems to be embracing Blockchain in a serious way now.

In an Observer Research Foundation (ORF) note, it was cited how the Government of India has been taking a keen interest in blockchain technology and its application to the public domain, as is evident from the release of the 'National Strategy on Blockchain' by MeitY in December 2021 - talking about adoption of blockchain in various sectors like healthcare, agriculture, finance, voting and e-governance. India might soon enable 'Made in India' blockchain technology for global use by 2027 - achieving convergence across blockchain, Internet of Things, cloud and Artificial Intelligence (yes, the 'BICA Stack'). Many departments are already exploring use of blockchain technology for land registration, issuing digital certificates and customs duty payment.

Examples all across India reiterate the interest and possibilities in Blockchain. Prateek Tripathi, Research Assistant, Centre For Security, Strategy and Technology, ORF outlines many examples. Like the use of NFTs for land mutation by the New Town Kolkata Development Authority in West Bengal. These NFTs can provide 'proof of land ownership' and all documents embedded with them are tamper-proof. This makes the land mutation process transparent - and also wipes away manual paperwork and record-keeping. Then there are instances like how municipal corporations of Durgapur and Bankura districts in West Bengal have also built a blockchain-based platform to issue legal



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- **Kirthiga Reddy**, CEO and Co-founder, Virtualness

documents like birth certificates. We also have the example of the 'Tamil Nadu Blockchain Backbone' or 'Nambikkai Inaiyam' for providing every citizen of Tamil Nadu with a unique state ID to consolidate all their essential documents like e-sevai, academic and birth certificates into a single digital wallet. In North India, there is the Uttar Pradesh Government which, in partnership with Polygon, has explored the 'Firozabad Public Grievance Management System' - an online portal based on blockchain technology for filing and tracking complaints. Small Industries Development Bank of India (SIDBI) is another good case. It is trying a block-chain based platform for the Indian MSME sector - to confront the growing issue of duplicate pledging of collaterals among MSMEs which has led to financial losses and challenged the trust factor across the industry.

A NITI Aayog report also cited the Union Territory of Chandigarh case. As a city that has existed for only 66 years and where most land parcels may have exchanged hands maybe 2 to 3 times, it was tough to ensure that every piece of land has a unique ID and is mapped for ownership (including change of ownership). This made it an ideal candidate for NITI Aayog to pursue a PoC project for land records using blockchain.

It is not hard to guess why so many industries are rewiring their ways to tap the beauty of Blockchain. At a basic level, this is a distributed digital ledger or database. But its real-time, tamper-proof and consensus-driven traits ensure that any change made in this ledger is visible, transparent, and corruption-free. The advent of 'smart contracts' after the launch of Ethereum in 2014 has opened a wonderland of new applications and self-executing contracts - adding more business-world relevance for Blockchain.

Virtualness, recently partnered with Indri Single Malt to provide authentication and proof of verification to consumers. This was a great use-case in demonstrating how blockchain can elevate consumer trust and secure ownership records - thus, making the supply chain more transparent.

Kirthiga Reddy, CEO and Co-founder, Virtualness cites this case and explains,

"Imagine a system where every step - from raw material extraction to product delivery - is documented on a secure, tamper-proof ledger. This is what blockchain offers. By tracking the movement of goods with pinpoint accuracy, we can expose unsustainable practices like deforestation or unethical labor conditions. Consumers, for the first time, can have real confidence in the claims made about the products they buy."

A 2023 joint report by ASSOCHAM and EY also indicates that 40 percent of surveyed Indian businesses across various sectors are planning or piloting blockchain projects. As per GlobalData, the blockchain market size revenue was pegged at \$12.4 billion in 2023 and it can rise at a compound annual growth rate (CAGR) of more than 57 percent over the forecast period of 2023-2030. In the 2024 Manufacturing Vision Study from Zebra Technologies Corporation, it was spotted that 57 percent globally, and 63 percent (in APAC, including India) of manufacturing leaders expect to increase visibility across production and throughout the supply chain by 2029.

Recent trends show blockchain fast gaining traction across varying sectors like manufacturing, logistics, and government services, observes Subramaniam Thirupathi, Director of Sales for India and Sub-Continent, Zebra Technologies. "Notably, global bio-pharmaceutical manufacturers are already using blockchain to track vaccines, to ensure their product integrity and safety."

Surprisingly, even fresh-off-the-boat industries like EV (for battery supply chain and energy consumption) and Renewables (smart Power Purchase Agreements and REC certificates) are finding strong advantages in Blockchain.

TRANSPARENT BUT GREEN. GREEN BECAUSE TRANSPARENT

There is a big green upshot that emerges through



Blockchain can give accurate and real-time facts on useful resource use and waste manufacturing.

- **Saurabh Rai**
CEO, Arahas

Blockchain. “Companies can no longer greenwash their practices, and consumers can make informed choices that align with their values. This, in turn, incentivizes businesses to adopt sustainable practices throughout their supply chains.” Reddy elucidates.

“Blockchain can be utilized to monitor water usage, plastic production, energy sourcing and consumption, and waste reduction and recycling, thereby promoting sustainable operations. For instance, major retailer Walmart has adopted IBM’s blockchain-based Food Trust network to ensure product safety, reduce waste, and verify sustainability claims, illustrates Dhirender Mishra, Associate Vice President, Growth Advisory, Aranca.

Traditional supply chains often suffer from opacity, making it difficult to verify the sustainability of sourced materials, explains Padmakumar Nair, CEO and Co-Founder of Ennoventure, Inc. “Blockchain addresses this by creating an immutable ledger that records each step a product takes from origin to consumer. This transparency ensures that every transaction is traceable, which helps in verifying that materials are sourced responsibly and sustainably. For instance, consumers can scan a QR code to see the entire journey of their product, ensuring it adheres to ethical and environmental standards.”

Consider how electronic products embedded with blockchain can be traced and managed throughout their lifecycle, ensuring proper disposal and recycling. Nair opines that the combination of Blockchain and IoT offers a thorough understanding of the whole supply chain by enabling real-time tracking of supplies and items. “Businesses may

guarantee adherence to sustainability guidelines and promptly resolve any difficulties by gathering data at every stage. Another trend is the development of decentralized energy grids. Peer-to-peer energy trading is made possible by blockchain, giving people and companies the ability to directly purchase and sell renewable energy. This encourages the use of renewable energy and reduces dependency on conventional energy suppliers, resulting in an ecosystem for energy that is more sustainable.”

Siddharth Ugrankar CEO & Co-Founder at Qila. Io adds how blockchain has been widely adopted in carbon credit and renewable energy certificates. “With the adoption of blockchain, it makes it easier for companies to offset their carbon emission by transparently trading carbon credits, avoiding double counting. This makes it easy to measure the environmental benefits.”

Saurabh Rai, CEO, Arahas adds that blockchain can improve useful resource control through presenting accurate and real-time facts on useful resource use and waste manufacturing. “This information can be used to optimize operations and decrease waste.”

However, there are still gaps to address. Blockchain technology itself can be energy-intensive, and we need to ensure these systems are built on sustainable protocols. We need to be conscious of the protocols we choose for blockchain systems, opting for those designed with energy efficiency in mind.

Nair also contends that since current blockchain networks can be resource-intensive, this is still a major concern that may prevent large-scale supply



There are potential risks in the initial stages of implementation of the technology due to the possibility of hacking, cyber-attacks and technical glitches.

- **Prateek Tripathi**,
Centre For Security, Strategy and Technology, ORF



Funding for advanced research and encouraging global collaboration will be key to enhancing India's blockchain expertise and supporting the sector's growth."

- **Neeti Sharma**, CEO, TeamLease Digital

chains from adopting blockchain technology widely. "Interoperability between different blockchain platforms is also crucial for seamless integration across sectors and regions. Moreover, switching to more energy-efficient consensus methods like proof-of-stake is necessary to address environmental concerns raised by blockchain technology's energy consumption, particularly in proof-of-work systems."

Cryptocurrencies such as Bitcoin that use Proof of Work (POW) for its consensus mechanism need heavy computational power which requires high energy usage and more carbon emissions, Ugrankar echoes that concern. "This challenge is being curbed to some extent with the adoption of different consensus protocols such as Proof of Stake (PoS), Ethereum 2.0 has been using the proof of stake model to reduce its energy consumptions and carbon footprint."

IT'S NOT SMELLING ALL BLOCKCHAIN YET, BECAUSE....

We cannot ignore the stains that have appeared on this glass pipe - even if it looks all sleek and shiny.

Let's turn to an analysis of NITI Aayog's pilots - as shared in a NITI Aayog report 'Blockchain: The India Strategy' 2020. One key challenge outlined here was Garbage In, Garbage Out. A significant amount of work is needed to ensure data is 'dispute free'. It also talked about how Blockchain's 'immutable' nature necessitates the need to create a 'single source of truth' before a process is put on the blockchain. It is also vital for blockchain systems to develop the capability to integrate with legacy systems. The initial implementation of blockchain solutions have hinted that they are more amenable to atomic transactions i.e. transactions that have a finite life, as compared to non-atomic transactions which may have large / infinite life e.g. land records.

Tripathi contends that there are many challenges on this path. "Blockchain technology can be complex and there is widescale ignorance of its benefits and inner workings. Blockchain technology itself

is not completely impervious to cyber-attacks, as is evident from cases like the '51 percent attack' on cryptocurrency wallets. There is also the issue of the capital required for the hardware implementation of the technology on a large scale. While this may not be a major issue for large corporate entities, financing is a major hurdle for smaller startups and even government establishments."

Other challenges also need attention, Putrevu points out. "Like managing large transaction volumes, regulatory uncertainty, high implementation costs, complexity, and a limited understanding of the technology among stakeholders."

Tripathi also brings to the fore the factor of regulation. "The legal status of smart contracts executed on a blockchain is still evolving in India and there are no established guidelines by the government at the moment."

Of course, humans will always be needed to push any technology. While premier educational institutions and a vibrant tech community provide a strong foundation, there is a notable shortage of specialized skills and practical experience, highlights Neeti Sharma, CEO, TeamLease Digital. "To bridge this gap, it is crucial to expand blockchain courses and specializations in universities, promote online learning platforms, and encourage IT companies to invest in upskilling their workforce. Government support through policy implementation, grants, and innovation hubs can further foster development."

As we can see, Blockchain is still finding its way around all these underground corners and sharp turns. If we can address the cybersecurity, talent, scalability and legacy-compatibility issues of Blockchain applications, we might finally find what the industry has been searching for - after the big digitalization party where the Climate Clock has struck a loud 12. We might get our hands on - The other glass slipper. But let's do it soon- before the other shoe drops. 

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