DLT-DRIVEN BFSI TECHNOLOGICAL CONVENTIONS

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Abstract:*Banking, Financial services and Insurance are an integral part of the global economy, so much so, they account for 20%-30% of the global service market revenue. Globally, the BFSI sector is a huge global financial supply-chain that covers from payment to settlement of a trade and everything in between, be it retail banking, financial brokerage or paying insurance premiums. Today, the global crypto-currency boom, powered by distributed ledger technologies (DLTs), has taken these financial supply-chains on to a different level, rendering existing BFSI technological conventions inefficient and incompetent. This is a threat if not heeded to, can obliterate the conventional BFSI sector. DLTs offer a never-before experience to the customer, who is at the epicentre of every service or business activity. In terms, transparency, security and trust crypto-currencies fair better than fait national currencies, which is because they are powered by distributed ledger technologies. DLTs have the power to disintermediate, and thus are vital in eliminating third parties and other intermediaries, and consequently lower transaction costs. This paper aims at offering an exposition on how DLTs can modernise existing BFSI technological conventions and resolve transparency, security and trust issues in global financial supply-chains.*

Key Words:*BFSI, Distributed Ledger Technologies, Financial supply-chains…*

"INNOVATION IS IN CRITICALSHORT-SUPPLY IN PERTINENT AREAS OF COMMERCE & INDUSTRY"

1. INTRODUCTION:

Globally, the BFSI sector is of immense prominence to the world economy as it generates over a third of global service sector revenues. BFSI is standard-industry terminology for Banking, Financial Services & Insurance, that spans across companies and banks that provide a wide range of financial products & services, other than transaction settlement. Today, banks are being challenged over banking the unbanked, credit disbursement, increasing number of non-performing assets, technological hurdles, risk management and contingency planning… etc. Similarly, Insurance and other financial services are facing challenges such as rural market penetration, pricing risks, transaction settlement issues, security & trust issues… etc. Though the world today has a global financial system, it does not have a global transaction settlement system to speed-up cross border transactions. Global capital markets have not yet come up with swifter and easier ways to for firms to raise funds or swifter and accurate ways to settle capital market transactions. Disintermediation has almost certainly become the need of the hour. Fraud detection and prevention has become tougher all the while. Complex and time-consuming claims resolution processes have taken over. Information security has become ever vulnerable to various cyber threats. The likely end the era of 'Pax Americana' has also brought the future of a national currency like the dollar into question, while there looms a significant absence of a truly global currency that is not under any sovereign pressure. However, distributed ledger technologies like the Blockchain can fix most of these aforementioned woes of the global BFSI sector, and pave the way for further adoption in the wider service sector. Distributed ledger technologies are network technologies based on achieving consensus, or are consensus algorithms that share cloned digital data shared across multiple servers with no central administrator in the network. Often this network is secured with cryptography and has a high-level of byzantine fault tolerance. Thus, this paper aims to offers an exposition on how distributed ledger technologies can revolutionize global financial supply-chains.

Objectives:

- To anatomize 'DLT-Driven Transactions'.
- To explore how DLTs can improvise contemporary BFSI conventions.
- To analyse a few industry applications of such aforementioned composites.

Methodology: Data sources collected for the purpose of this paper are secondary in nature such as white papers, international agency reports, reputed media sources and reliable web sources.

2. ANATOMY OF DLT-DRIVEN TRANSACTIONS:

Distributed ledgers are consensus-based ledgers or databases that are synchronized across the network geography. All transactions are consensus-based and thus have a 'public-witness', while each network node (participant) has an identical facsimile of data that constitutes the network. Any changes or new transactions must

reflect in all the network nodes. Thus, transactions are maintained in a decentralized, distributed form that eliminates the need of a central authority to fight against network manipulations and cyber-attacks. The use of cryptography keeps information secure within the network, so that no network node may get access to others' confidential information, ensuring that no single stakeholder gets full control of the network. Through Bitcoin, Satoshi Nakamoto (unknown) introduced blockchain technology as the world's first distributed ledger technology. Alongside blockchain, today Tangle is another promising DLT for the future of transaction recording & settlement.

2.1. ANATOMY OF 'BLOCKCHAIN' TRANSACTIONS:

In his white paper, Satoshi Nakamoto, proposed blockchain through bitcoin, eliminating the problem of double spending in a peer-to-peer network with no central authority that requires cost-intensive proof-of-work computations to record transactions in the public domain. [1] In a network, a single server vaults all the information; instead, blockchains allows storing information across multiple servers and lets them distribute and validate incoming information. This makes it penetrating into the network for the sake of manipulation almost impossible.

Existentially, the blockchain grows through the addition of new blocks. A block contains four essential parts, namely:

- Hash: That acts as a unique identification code for the block.
- Chain: The series of blocks prior to the present block, connected with hash pointers.
- Transaction data: All the chosen transactions by the miner.
- Public keys: That help identifying senders & receivers.

The continuous addition of new blocks is what that makes blockchain a chain. The chain is a timeline of all transaction blocks as discussed above. This chain itself is a ledger that records in real-time all events associated with the block and makes it publicly visible. A new block can be added to the chain only when one of the network nodes (participant) successfully solves a complex mathematical problem that often requires high computing power, and gains the right to add the next block. These complex, algorithm-rich computations can also be called as proof-of-work/stake computations, which make blockchain almost Sybil-resistant, and its decentralized nature gives it a high-level of 'Byzantine Fault Tolerance'. Complex, algorithm-rich proof-of-work computations also act as the 'consensus mechanism' that ensures a high-level of data integrity to the transactions on blockchain and reduces chances of falsified entries. People who use high-computational power to solve proof-of-work computations and add the blocks to the chain are called miners in blockchain; they are also the network nodes. To briefly anatomize blockchain transactions, transactions are initially encrypted and added to an online ledger. It is further sent into the blockchain network where network nodes take them up in a block and solve complex proof-of-work computations to add the next block onto the chain.

2.2. ANATOMY OF 'TANGLE' TRANSACTIONS:

The underlying technology behind tangle is the 'directed acyclic graph' [3], that unlike blockchain's single chain builds a mesh of transactions, where in new transactions have a direct reference to old transactions, while TPS (transactions per sec) increases. Tangle has effectively removed the need for miners, which has resulted in the elimination of transaction fees. In tangle, each square, also known as site represents a single transaction. Each site is connected to at least two other sites, which are called edges that validate the transaction. Every network node that adds a transaction is involved in validating other transactions. Each transaction could be trusted because of its weight. Weight can be considered equivalent to proof-of-work in blockchain, it is the amount of work or the number of transactions validated by a network node. Further, a cumulative weight can be known and can be used as a standard of trust. Thus, complex, cost-intensive, algorithm-rich proof-of-works that ask for high computational powers are not required to gain consensus as in the case of blockchain.

Tangle, compared to blockchain has no scalability issues. Thus, because of its structure, it is unlimited in terms of TPS, while blockchain is limited in terms of TPS. Tangle does not require a full copy of all the previous transactions, thus it also has no storage problems like that of blockchain's network nodes. Tangle needs no miners, which means no fees, which makes it highly suitable for micro-payments. Thus, IOTA, a tangle-based crypto-currency has been designed and marketed for an IoT economy, where machine-to-machine interactions take place. In addition, as there are no miners, disagreements and forks are limited to the maximum. Tangle is considered 'quantum-secure'. That is, quantum computers running on Shor's algorithm can be capable of decoding current generation cryptographic signatures. Tangle uses 'Winternitz signatures' [3] which is a post-quantum cryptographic technique, and by design makes tangle 'quantum-secure'.

3. REVERSE ENGINEERING: FEATURES OF DLT TRANSACTIONS:

Blockchain was a first generation of DLT, while Tangle is part of the imminent generation. After anatomizing transactions on these two different generations of distributed ledger technologies, we arrive at some general points, which can be termed as features of DLT transactions.

- Consensus: DLTs are consensus-based, which makes it mandatory for every transaction or block transactions to achieve consensus by establishing proof-of-work/stake. This gives transaction data a high-level of data integrity and authenticity.

- Decentralization: DLTs allow no single network node to take control of the entire network, which has led to decentralization. The idea behind decentralization has been to establish a system without trusting a central authority like a bank or a government and thereby cause disintermediation. Decentralization has led to empowering network nodes and increased durability and resistance from cyber-attacks, as there is no single point of centricity or vulnerability. Higher transaction rates coupled with lower transaction costs. Complete transparency.
- Tamper-proof: Transactions on DLTs are immutable, as all the network nodes have identical copies of the same information that constitutes the whole network. Thus, DLTs are 'fraud-protected' as the network is decentralized.
- Security: The use of cryptographic techniques and post-quantum cryptographic techniques keeps information secure or maybe even quantum-secure. The use of public and private keys ensure that only the senders and receivers in the transaction have to access to information related to the transaction.
- Byzantine Fault Tolerance: DLTs are often Byzantine Fault Tolerance or have a high-level of tolerance. No single entity can interrupt and form a misleading consensus or lead to no consensus at all.
- Scalability & Storage: Blockchain has several scalability issues that make transaction processing slower and uneconomical. In addition, as it is a distributed ledger it requires immense storage space. However, as various versions DLTs have come by, these issues have now almost become redundant.
- Sybil-resistant: DLTs are resistant to Sybil-attacks as they require network nodes to either solve complex proof-of-work computations or establish proof-of-stake through various 'weighted voting models' to add the next block of transactions or transactions.
- Transaction Nexus & Trusted Timestamping: Every transaction is connected to previous transactions, in a way that transaction history can be reconstructed. Transactions are recorded in the order they took place, using trusted timestamps, although in blockchain it can be subjected to the miner's bias.
- Standardized Transaction Rules: These rules apply to all recorded transactions. Movement from point A to point on a ledger should be according to the rules of the network. These rules formed the basis for the evolution of smart contracts.
- Ownership & Identification: With unique private & public keys, ownership & identity can be anonymous while transactions can be pseudonymous That is, transactions can take place, while sender-receiver privacy can simultaneously be sustained.

4. DLT-DRIVEN BFSI CONVENTIONS:

Blockchain maybe a first generation DLT, but it has formed the basis of most DLT-Driven conventions in BFSI. Globally, banks and financial services firms have accepted the potential of a technology like blockchain. Blockchains facilitate multi-party interactions by providing access to persistently updated ledgers that cannot be manipulated by any entity. DLTs have successfully amalgamated distributed and decentralized databases and high-level security conventions like quantum-secure cryptography, which has made them irresistible for the BFSI sector.

4.1. BLOCKCHAIN REGISTRIES & KYC COMPLIANCE:

- Currently, KYC requests & processes cause huge transaction delays, while also entailing huge financial burden on banks for non-compliance.
- A blockchain KYC registry distributes KYC information to member banks, and allows them to make encrypted updates regarding client information, while holding it securely. These records could also prove whether a bank acted according to KYC norms and regulations to the regulators.
- This shared database of client information can make transactions swifter and reduce financial burden in the form of non-compliance penalties and KYC costs for banks and financial services firms.

4.2. SMART AUTOMATED MECHANISMS:

- Blockchains, with smart contracts can facilitate automated mechanisms. Smart contracts are protocols in code that can hold and execute pre-programmed instructions on achieving certain conditions.
- For instance, financial transactions can be executed when a certain criteria is met.

4.3. DLT-DRIVEN PAYMENTS SYSTEMS:

- Distributed ledger technologies can lead to disintermediation in the payments process, while increasing TPS significantly with high-level cryptographic security at almost no cost between organizations and their clientele and among banks themselves.
- A timely updated and unalterable ledger of transactions of all sorts of payments will be available to all the members, reducing the chances of real-time fraud.
- Interoperable distributed ledgers can facilitate a global payments network that can connect all banks and all national currencies and provide a conducive transactions environment for payments of all sorts.

4.4. EXECUTION, CLEARING & SETTLEMENT (ECS):

- The ECS process in the transfer of financial instruments currently is a time-consuming and cost-laden process. Centralized clearing and settlement systems in global markets may take up to three days' time, while accounts have to be matched, reconciled and resolved (if any) for thousands of investors.
- DLTs can speed these processes up by settling them in near real-time and at almost no transaction costs. Digitizing these processes on distributed ledgers can save the banking and financial services industry over $20 billion annually. [4]

Trade Finance

- Distributed ledger technologies can provide access to numerous parties about the same information from anywhere in the world. One area where numerous parties interact and ton loads of paperwork is required is trade finance.
- For instance, a single intercontinental shipping container may need approvals from over 50 different parties, including intragovernmental organizations at one time to leave a port. A single paper or approval lost or not submitted can cause great delays. Now if these papers are on a distributed ledger, where only parties that are required in the transaction can see and approve those papers, things could have been simpler and shipping intercontinentally would have been swifter. Bills of lading and letters of credit can be sent on distributed ledgers to all concerned parties.

No-Fee Micropayments

- Third generation DLTs like Tangle have already made no-fee payments a reality. This has been designed for IoT machine-to-machine interactions.Banks can as well use this technology to facilitate micro-payments, and use it as a key strategy to process no-fee transactions in banking the unbanked.

Syndicated Lending

- Syndicated lending, where a consortium of lenders lend to a single borrower is still one of the most intricate parts of the lending practice. DLTs can bring transparency and efficiency into such a market.
- It can display interest accrual, detailed transaction data, and other borrower's compliance of credit agreements to the lenders. Above all, it will maintain an immutable timestamped detailed record of transactions accessible to lenders at all times, which will cut loan administrational costs and provide accurate and true information for lenders to optimise their lending portfolios.Globally, seven banks that account to 10% of the syndicated loan market have already ventured into this area. [5]

Trading Platforms

- DLTs can facilitate a medium for the exchange of tradable assets like securities on a stock exchange, without the problem of double spending and without the oversight of central authorities or the need for intermediaries.
- Operational risks can be muted as transactions are immutable and transparent and ownership after the transaction is confined. Underlying commodities are traceable as a permanent record of transaction is maintained.
- Difficult-to-trade metals and commodities can be tokenized and ownership easily be traded while they remain secure in a vault somewhere in the world.
- The use of cryptography can provide to only permissioned parties and thereby keep all the trade and transaction related information confidential. Moreover, as mentioned earlier, clearing and settlement time and costs can drastically be reduced by using distributed ledger technologies.

Enhanced Claims Processing & Management

- When insurance policy claims are made by consumers, DLTs can verify these claims and ensure only valid claims are compensated, as the network would know if the claims were or not.Through smart contracts, when a certain criteria is met, claims can be automatically processed without requiring a human to verify and do the exact same thing.

Fraud Prevention

- DLTs can help in fraud detection for insurance companies are as they are continuously embattled with fake claims. Insurance companies in the US lose almost $40 billion by validating fake claims, according to the FBI.
- DLT features such as immutable record of transactions, trusted timestamping, standardized transaction rules, unique identification; security through high-level cryptography is one reason why this technology is most suited for the insurance industry to fight fraudulent transactions.

Banks, insurance companies and financial services firms are today at the focal points of the 'crisis of trust'. The global crypto-currency boom has added fuel to this on-going crisis of trust that the global BFSI sector has been stuck up in. All of this happens at a time, when a great proportion of people in the world remain unbanked or under-banked and technology has made machine-to-machine transactions possible. DLTs such blockchain have a proven mechanism in place that can build trust, because of its transparent and tamper-proof nature. Blockchains have the potential to create an internet of value, thus it has become pertinent than ever, for banks, financial services firms and

insurance companies to look into the potential of technologies like the blockchain and tangle so as to reach out in terms of providing efficient and inexpensive services to both the banked and unbanked globally.

5. INDUSTRY APPLICATIONS:

5.1. RIPPLE: BLOCKCHAIN-ENABLED GLOBAL PAYMENTS PROTOCOL:

The Ripple Transaction Protocol (RTXP) is a distributed consensus ledger that has its own crypto-currency (Ripple or XRP) and acts as a real-time gross settlement system for exchange and remittance of almost anything, from fiat currencies to gold. Ripple currently enables secure and inexpensive global transactions of any scale with no specials requirements for chargebacks. Ripple uses the blockchain technology, which makes it based around a shared public-database that requires consensus for exchange and remittance. Ripple comes pre-loaded with 100 billion XRP, thus it does not require miners to mine any new ones out. Then from where does it derive all its value? Ripple is a digital asset that acts as a bridge between financial institutions to exchange fiat currencies globally, in a faster, inexpensive, highly secure and reliable way. In the words of Antony Lewis, head of business development – itBit, Ripple is an exemplar for a medieval banking system with a digital twist. [6] He ascribes it to the Arabian 'hawala network' of the medieval times. A hawala network is one that operates relying on IOUs issued by intermediaries/hawala-agents without an actual transfer of money. For instance, if A has to transfer money to B at a distant place, A can approach a hawala-agent, pay them, and direct them to make a payment/transfer to B, on which the agent of A issues an IOU to the agent of B. When B approaches his agent, the agent makes him the payment. This kind of a transaction calls for trust at all the levels of the transaction. Ripple transaction gateways do the exact same job of the intermediaries digitally using the blockchain as in the aforementioned example. If there is no direct trust between the gateways, the protocol finds another gateway that trusts both of them. If there are no reliable intermediary gateways, the transaction can take place by transferring an amount of XRP (similar to the dollar amount) that can be converted at the point of withdrawal by the person or organization to which the payment is being made.

6. AUSTRALIAN SECURITIES EXCHANGE: DLT-DRIVEN CLEARING HOUSE:

The Clearing House Electronic Sub-register System (CHESS) at the Australian Securities Exchange recently was replaced with the ASX blockchain, a distributed ledger technology designed by U.S. based start-up Digital Asset, which has been the first DLT enterprise that has been recognised by a systemically important market infrastructure in the global securities marketplace. Unlike Bitcoin'sblockchain, the ASX blockchain is a precedent-setter that employs a private 'permissioned' distributed database, where participant access can be limited and clearing house activities can be performed even more efficiently. NASDAQ has come up with a blockchain for private security transactions that may help overcome liquidity problems in private securities. Japan Exchange Group and IBM are exploring a blockchain for trading in low transaction markets. Deutsche Börse and Deutsche Bundesbank have developed a blockchain-based prototype for a swifter settlement process. NSE in India, along with a few public and private banks has established a blockchain-based ledger to exchange KYC information. MOEX in Russia has already conducted a trial blockchain-based e-voting system for bondholders. Santiago Exchange has collaborated with IBM for complete blockchain solutions from reducing errors, preventing fraud to fastening transaction processing. LSE in London has been exploring the blockchain technology to improve the post-trading activities. [7] DLTs may revolutionize the core infrastructure systems of capital markets round the globe, resulting in greater transparency and potency.

7. THE B3I PROJECT: BLOCKCHAIN IN INSURANCE:

The B3i project in the insurance industry is a global cooperative partnership among some of the largest insurers and re-insurers initiated to explore the potential applications of DLTs to benefit all the stakeholders in the value-chain. Blockchains prove an asset for insurers and re-insurers as it streamlines excess paperwork, reconciliations for insurance contracts and re-insurance, speeds up the flow of information and money, while significantly enhancing auditability. [8] Blockchains can facilitate multi-party interactions; record such transactions, enable digital contracts in a secure and transparent way, which makes it a well-suited technology for the insurance industry. The B3i is a pilot project involving over 23 insurers and re-insurers focussing on viable value-chain solutions by establishing trust amongst all the stakeholders, while providing an automated condition-based contract execution environment by ensuring constancy in contracts and execution. Moreover, serve as an immutable record of transaction to help fight insurance fraud and reduce managerial burden of all stakeholders. The project is in its nascent stage, and the long-term goal remains to evaluate whether the blockchain could make the insurance industry even more efficient and achieve greater insight about the applicability of this technology for the greater good of the global insurance industry.

8. CONCLUSION:

Globally, BFSI is an integral part of the financial supply-chain everywhere. Contemporary BFSI conventions have been rendered obsolete and inefficient in terms of providing valued-service to all the stakeholders sustaining the value-chain. DLTs are new into this foray, causing financial innovations to happen like never before and enhancing

stakeholder-relationships in the value-chain. Three generations of distributed ledger technologies have been unleashed, from Bitcoin'sblockchain to IOTA's DAG-based Tangle. As the global BFSI sector remains at the focal points of the crisis of trust that ensued in the aftermath of the financial meltdown of 07-08, DLTs offer market makers of the BFSI sector a chance to rebuild trust and enhance stakeholder experience. This is possible for the fact that, DLTs have consensus-based decentralized operations on a shared, distributed ledger that can maintain an immutable record of the transactions, secured by high-level cryptography. The world today has a global financial system, and it can as well have a global transaction settlement system to speed-up cross border transactions with DLTs. Global capital market infrastructures can employ DLTs and come up with swifter and easier ways to for firms to raise funds and swifter ways to settle capital market transactions. Disintermediation is the immediate by-product of employing DLTs. Fraud prevention will become easier as this technology is implemented on a larger scale. Complex and time-consuming claims resolution processes will no more deteriorate customer experience. The on-going digital revolution powered by technologies like the blockchain is sure to manifest an internet-like platform that reflects true transactional value, on which information and money will find safer and secure ways to reach their destinations undefiled.

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