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Business ready blockchains
for smarter supply networks

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Executive summary

Economic Networks & Markets are a necessity for any organization today. It is rarely possible for any single organisation to create value without depending on the products & services provided by other organizations. Relying on business partners, suppliers, service providers increases hidden transaction cost:

- Asset misappropriation, which includes fraudulent billing, occurs in 89% of cases.
- Overstocks and out -of -stocks cost $1.1 trillion globally in lost revenue.
- Procurement professionals spend the majority of their time on the 80% –90% of the suppliers that represent less than 5% – 10% of spend and business value.
- 58% of trade finance requests by SMEs are rejected; $1.5T in unmet demand for trade financing.
- The value of trade in counterfeit and pirated goods is estimated to be $1.9 Trillion.

In the era of Industry 4.0, ultra - high efficiency production, and border-less commerce, addressing these challenges can create strategic advantages.

marketsN is a Blockchain & AI based, cloud hosted solution designed to address these challenges.

- Automated Contracts reduce transaction costs & prevent billing fraud.
- Embedded Finance increases trust in invoices, reduces risk & lowers the cost of capital.
- Wider supply network visibility leads to real time accountability & enables better planning.
- Built-in AI learns from wider, deeper data & improves performance over time.
- Product Provenance ensures compliance & guards against counterfeits.

B2B networks and markets in the era of blockchains and AI

Global trade today is more than 40 - times larger than in 1913. The expansion & integration of trade over the last century has been largely possible because of reductions in transaction costs stemming from technological advances. In the last century, sea freight costs have fallen by 70%, air transport costs by 90% and international calling costs by 99%. In the last couple of decades, Internet and related technologies have further reduced transaction costs: by creating electronic market places, helping to realize cost reductions, increasing productivity, enabling e-procurement, integrating business processes and allowing for the creation of customized services.

Transaction costs are so fundamental to business strategy because they determine what an organization must build internally vs what it must buy from suppliers or service providers. As transaction costs change, organizations must adapt their build vs. buy strategy too. Emerging technologies like Blockchain & AI reduce transaction costs and offer an opportunity for organizations to rethink their strategy.

Blockchain has value because it offers a secure and distributed mechanism for value exchange. A second pillar of this technology are Smart Contracts. A Smart Contract is a piece of software which is guaranteed to execute once deployed without any need for human intervention and the result of whose execution is stored on a Blockchain.

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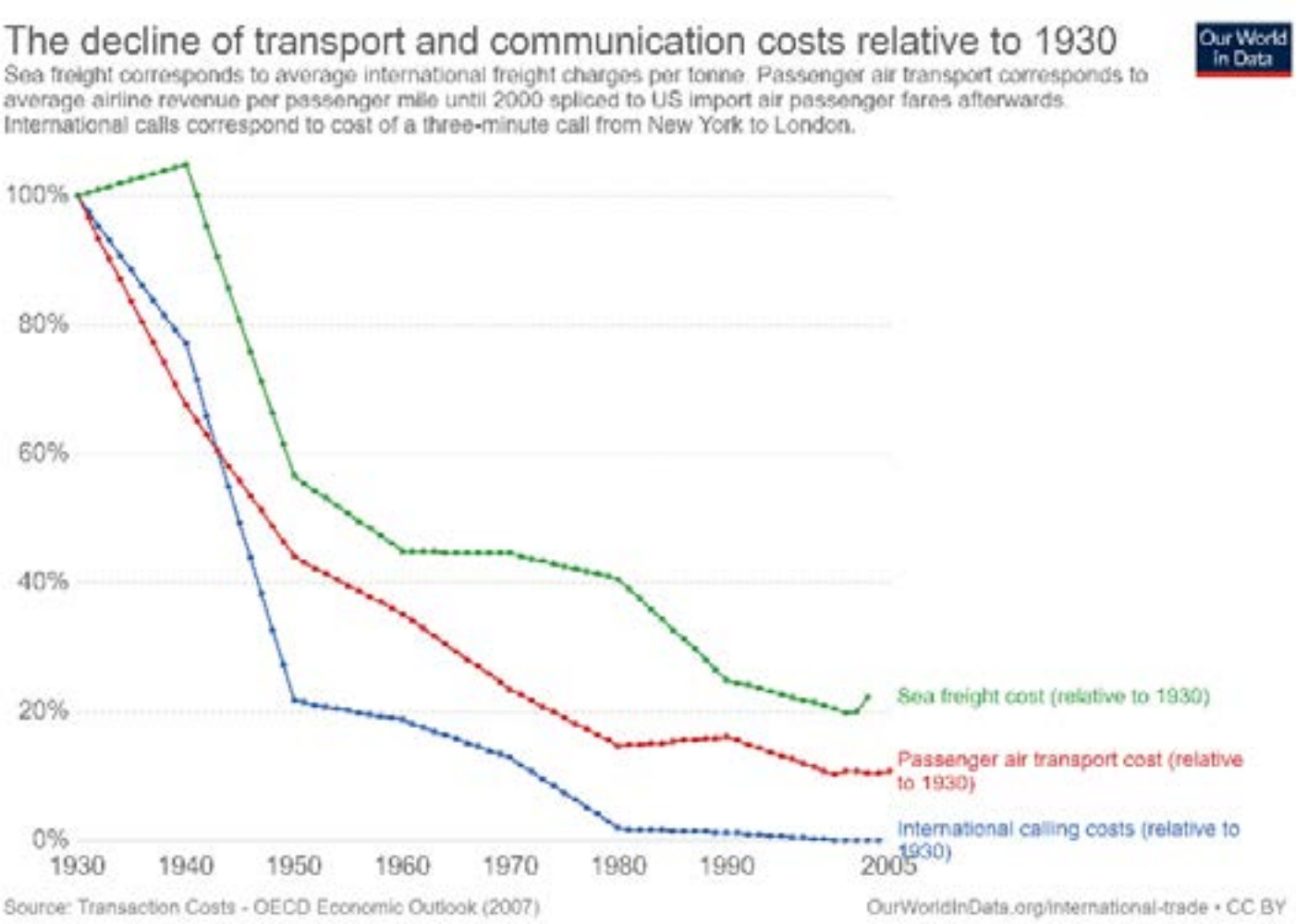

Thus, all stakeholders in the ecosystem can access provenance, authenticate records, prove compliance & automate contract enforcement.

AI has value because it has the potential of deriving transformational insights from data. Organizations are beginning to identify data as a key resource. This also means, however, that organizations are much less willing to share their data outside the organization. This leads to reinforcing the current paradigm of data living in silos. The promise of deriving truly transformative insights is thus constrained. **Data available on Blockchains is uniquely valuable in this aspect since it is implicitly shared & trusted. Insights derived from mining this data are therefore implicitly trustable. Using these insights many decisions which require human intervention & subjectivity today can be taken over by algorithms based on human-configured priorities.**

marketsN uses Blockchains & AI to reduce transaction costs & improve market efficiencies

The Challenge

In today's highly inter-connected world, economic value gets created by firms collaborating with each other. Inter-firm collaboration can take many forms: from supply chains & distribution networks to industry consortia and geographically co-located economic clusters. These collaboration networks effectively create a network or a market clique, enabling trades among these firms.

B2B relationships in these networks are maintained using a variety of mechanisms (e.g. contracts) and tools (e.g. ERPs). In B2B networks & markets, transfer of value (products, services, payments) is carefully recorded by each organization (e.g. in an ERP). As the long -lived transactions proceed, information is exchanged by emails, phone calls or chat messages. Despite efforts like EDI (Electronic Data Interchange), processes relying on emails, spreadsheets & PDFs are still common - the primary challenge with such processes is that each party has a "copy" of the transaction e.g. purchase orders, invoices, and payments. Given the complex work flows, these copies can get out -of-sync. **Transactions that are not in agreement require time consuming research, repair, revision, reconciliation, negotiation and hopefully settlement.**

Achieving frictionless trade in B2B settings requires that technology must be adopted not just inside one organization but across organizations involved in the whole supply chain.

An important aspect of this challenge is technology adoption. Achieving frictionless trade in B2B settings requires that technology must be adopted not just inside one organization but across organizations involved in the whole supply chain.

Over 60% of procurement organizations judge the suppliers lack of awareness and infrastructure to optimize B2B processes as a hindrance on the way to an integrated B2B solution. They also acknowledged that current B2B integration scenarios are not balanced and neglect the position of the suppliers. Unless a solution benefits every organization in the network, it is unlikely to see adoption.

The problem is outdated technology. Given the speed of innovation, a lot of today's enterprise technology is obsolete. Few people realize, for example, that ERP was launched in 1974, almost half a century ago.

Business ready blockchains for smarter supply networks

Introducing marketsN

marketsN is a Blockchain & AI based, Cloud hosted solution for organizations to integrate their business networks. It offers a technology solution which incentivizes adoption by every organization in an economic network so as to reduce transaction costs & improve market efficiencies.

Automated contracts reduce transaction costs

A cornerstone of enterprise technologies today are ERPs: a critical tool for managing operations in modern enterprise. In spite of deploying the best ERP and EDI systems, large swathes of critical information are still exchanged through emails, PDFs and excel sheets. **Even though solutions for EDI are supported by 62.5% of the companies, they are used only occasionally in the large majority of cases because it is difficult to involve all partners in such a solution.**

What were the prices at the time of the shipment, the mode, the service level and what extra charges were allowed? Is the billing correct, were the service levels met, are there issues with the shipment which need remediation before billing goes out?

At the heart of the issue is enforcing terms of the contract negotiated with business partners. **On average, procurement professionals spend the majority of their time on the 80%–90% of the suppliers that represent less than 5%–10% of spend and business value.** Contract Management is challenging for two reasons:

- Contracts are in text format – enforcement thus requires manual interpretation. This can lead to disputes & in the worst case may require legal recourse;
- The information required to verify contract terms is replicated across ERPs; this must be reconciled before payments can be settled.

marketsN contains a library of pre-built procurement contracts codified as Smart Contracts. By embedding incentives & penalty terms in Smart Contracts, marketsN enables **automatic enforcement of contract terms** using transaction data recorded on the Blockchain. This reduces enforcement costs and enhances process transparency. **Invoices are automatically generated & reconciled** protecting against fraudulent billing and ensuring that buyers pay only for goods & services which were delivered as contracted. marketsN smart contracts can be customized using a rules engine to embed terms for returns, delays etc.

- Since Smart Contracts are coded in software, there is **no ambiguity** in what bonuses or penalties will be applied under any given condition.
- Since these Smart Contracts are deployed on the group's Blockchain,

they are **guaranteed to execute as coded – without human intervention of any group member.**

- Since inter-org transactions are recorded on a shared ledger, the true status of orders, shipments, delivery information is known to all stakeholders; **no reconciliation is needed.**

Since contract terms are applied in a transparent, trusted way across organizations, **it reduces disputes & arbitrations.** By automating enforcement, marketsN reduces the cost of administering contracts - this opens the door to designing more effective contracts leading to further supply chain efficiencies. Prebuilt Smart Contracts in marketsN allow incentives of organizations in the group to be aligned with incentive compatible Smart Contracts. These contracts are flexible enough to be optimized on a case-by case basis based on empirical data. Auditors can focus on confirming the validity of the codified contracts rather than auditing transactions. This enables greater focus on more complex transactions and internal controls.

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Embedded finance reduces risk

Supply chain fraud is a threat for organizations of all sizes and in all industries. Common supply chain fraud schemes include bid rigging, fraudulent billing, counterfeit goods, and misappropriation of assets. The size of the problem is huge. Asset misappropriation, which includes fraudulent billing, is the most common fraud scheme, occurring in 89% of cases. marketsN provides safeguards against these common supply chain fraud schemes:

- **Automated Contracts guard against fraudulent billing;**
- **Produce Provenance protects against counterfeiting.**

marketsN allows setting restrictions on departmental spending limits and real time notifications when budget constraints are about to be violated.

To further guard against frauds, marketsN effectively embeds finance into inter-organization transactions. **CFOs can track the movement of every transaction and have real time visibility into payments as money moves in the supply chain.** marketsN also allows setting restrictions on departmental spending limits and real time notifications when budget constraints are about to be violated. **Real time tracking of payments & budgets ensures that financial data is accurate which helps automate the audit process – a key requirement in B2B settings.**

Along with orders & invoices, payment due for these transactions are also recorded in the shared ledger in a privacy aware fashion. Account payables and receivables between every pair of organizations in a group are automatically updated as orders, delivery & invoicing proceeds. marketsN enables these trusted assets (invoices etc.) in a group to be shared securely outside the group. An organization with an outstanding invoice on another group member can share their invoice with a bank. **Unlike a traditional document, marketsN shares a live copy of this invoice which gets updated as the invoice gets accepted, reconciled and paid.**

More reliable data for banks and NBFCs

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is being captured on the Blockchain & shared with the bank in real time, this significantly reduces the risk of lending. Banks can reduce lending rates, therefore reducing the cost of capital for group members. The growth and sustenance of the global $8 trillion open account trade finance market are heavily reliant on the easy availability and robustness of financing mechanisms. With marketsN, a heightened trust in collaterals makes them available for low-risk, lower-interest financing from banks & NBFCs.

Network visibility enables better planning

Organizations have a stake in ensuring B2B suppliers, partners, and distributors can fulfill orders and provide enough information about such transactions to meet customer demands. Yet, most organizations today have limited visibility beyond their immediate suppliers. They lack meaningful insights into their supply network. Without the necessary supply chain knowledge or supply chain oversight, areas such as working capital, cash flow levels, and data analysis are impacted. This prohibits the ability of businesses to quickly adapt & plan.

With marketsN, procurement managers can **monitor their suppliers and suppliers-of-suppliers** to coordinate the complete supply chain. By enabling a single view of inter-org processes & transactions, marketsN allows each organization in the group to have process visibility across the supply network encouraging **accountability and quickly identifying bottlenecks.** This enables greater oversight and control of the complete supply network.

marketsN creates a shared ledger across all organizations in a group. By enabling a single view of information across group, marketsN provides each organization **visibility of inventory levels distributed across organizations.** This reduces the risk of inventory shortages and shortens lead

Real time visibility combined with undisputable records of all changes in distributed inventory prevents inventory fraud.

times. It allows each group member the flexibility to make rapid decisions and update inventory levels on a continuous basis, thereby reducing working capital inactivity. Real time visibility combined with indisputable records of all changes in distributed inventory prevents inventory fraud. The operational efficiency gains are hard to miss.

As data about current & past transactions gets created & recorded on the group's Blockchain, information about supply and demand are available in real time. **By heightening visibility to include spend under management, demand, inventory, and shipments, marketsN speeds up the flow of information to help reduce the entire planning cycle, assists in more effective measurement, and reduces overall supply chain risk.** Supply Chain Planning can now optimize operations with information available across the supply network: **An evolution from Enterprise Resource Planning to Network Resource Planning.**

A positive repercussion of this shared ledger across organizations is that it also drives alignment of different stakeholders within an organization.

The integration of internal finance and supply chain functions with outward-facing vendor or customer-focused interactions, **unites the back office with the rest of the organization via real-time reporting for action.**

Each group member benefits from better control of their inventory, cash flows, and sourcing decisions. They can leverage the system to prove compliance or delays which were associated with certain actors in the chain (if legal actions are required).

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AI improves network performance over time

The default participants in marketsN are human users in each organization e.g. employees in a business. However, marketsN also supports machines & algorithms to act as participants in a group. **A built-in marketbot helps organizations learn from past data and makes in-context recommendations about demand forecasting, potential inventory stock outs, optimal prices, vendor selection etc.**

At the base of marketbot is data generated from inter-org transactions in a group. This data which was traditionally in silos is now available in a shared ledger, opening up new opportunities for deriving shared insights. Using verified, chronological data, marketbot creates industry standard SCOR metrics and measures the performance of a marketsN group in terms of Reliability, Responsiveness, Agility, Cost & Asset Utilization. **These metrics are updated in real time as transactions proceed thus eliminating the need for the standard reporting cycles across statutory, regulatory and management reporting.** Using trusted data ensures that the insights generated are genuine and decision makers can make sound business decisions e.g. organizations can compare their performance with other group members to continuously learn and improve their processes.

In multi-tier supply chains where order completion times depend on multiple suppliers and their interdependencies, marketbot predicts whether or not an order will be delivered on time and within quality constraints.

Leveraging historical data, marketbot makes predictions which can help supply chain managers plan better & respond to dynamic events. In multi-tier supply chains where order completion times depend on multiple suppliers and their interdependencies, marketbot predicts whether or not an order will be delivered on time and within quality constraints. These predictions are refined in real time as new information becomes available. Historical data also helps uncover trends which can help in **capacity planning.**

Marketbot tracks ongoing transactions in the groups. Any anomalies in supply chain operations are immediately notified to relevant stakeholders so that appropriate action can be taken.

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Anomaly detection algorithms are built-in and can be customized for each organization. **This approach allows supply chain leaders to have increased oversight and actively engage only when required.**

By evaluating multiple potential outcomes based on historical performance, market bot recommends actions that will maximize the long-run performance of the supply chain. These recommendations must balance multiple considerations e.g. supplier available capacity, supplier predicted performance, expected lead times, future demand forecast, costs as per contract terms. Comparative evaluation uncovers the potential for spend savings from sourcing & competition. With shared data available inside the group and using machine learning algorithms, market bot recommends the optimal action.

Product provenance ensures compliance

Many countries around the world have mandated that consumers should be able to track and trace a drug's current and past locations. When track and trace is correctly implemented, a drug can be tracked throughout the supply chain and traced back up the supply chain upon return or recall. According to the World Health Organization, it is estimated that up to $200 billion worth of counterfeit pharmaceutical products are sold globally every year. The value of international and domestic trade in counterfeit and pirated goods is conservatively estimated to be $1.9 Trillion. Although electronic drug pedigree solutions are being implemented to resolve traceability issues, these systems still rely on siloed sources of data and exchanges of information via two-way interactions, suggesting that the marketplace lacks a technology solution for the problem.

As consumers become more aware, similar compliance requirements are emerging across industries for environmental, fair-trade & safety standards. Beyond compliance, ensuring this information is available across the supply chain can be a powerful differentiator for brands & organizations.

marketsN enables each organization in the group to provide certification of goods & services they supply. Since each group in marketsN has a shared ledger across organizations, marketsN provides a full audit trail of product data, creating an everlasting means of record keeping along a supply chain. This greater oversight and control gives each organization increased confidence in the authenticity and quality of goods.

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For complex products where multiple components constitute a single end-product, **shared provenance records across stakeholders allow each stakeholder to trace which component was used to build which end products.** In sectors like automotive, this can facilitate effective product recalls in a cost-efficient fashion. This information is also critical for reducing warranty fraud.

For drugs & other perishables, where the end product quality depends on the conditions under which products were transported, provenance data could include temperature & humidity measurements during logistics. With logistics service

providers as group members in marketsN, **provenance data about transport conditions is recorded in the group ledger.** This data can be used to assure all stakeholders in the supply chain about product quality.

Insurance providers can use this information to validate claims. Compliance teams can track provenance of each product, its components and the conditions under which it was transported -- with auditable proofs.

For products with a long life cycle, provenance data about product usage can enable secondary marketplaces. A key challenge in markets for used goods in information asymmetry – **the seller knows more about the true value of the product then the buyer. marketsN allows sellers to prove the quality of the product they are selling by furnishing an audit able record of product usage, maintenance etc.** Secondary marketplaces using this information are thus more efficient.

Compliance teams can track provenance of each product, its components and the conditions under which it was transported -- with auditable proofs.

marketsN: How it works?

There are four key constructs in marketsN:

Groups

marketsN enables the creation of groups spanning multiple organizations. Think of each group as an e-marketplace (e.g. Amazon) hosted on the cloud enabling member organizations to trade and coordinate procurements. Member organizations retain control of this group and get benefits of dynamic market
places. In B2B groups, value transfer involves purchase orders, invoices, inventory transfers, payments etc. A group created using the marketsN integrates members organizations – both from a tools and processes perspective. Using Blockchains, a marketsN group provides not only a shared, cryptographically protected ledger to record transactions in a transparent, auditable way, but also a set of ready-to-use (customizable) work flows as Smart Contracts which unify the processes across organization and automate the enforcement of contracts.

Think of each group as an e-marketplace (e.g. Amazon) hosted on the cloud enabling member organizations to trade and coordinate procurements.

Contracts

Optimal supply chain performance requires the execution of a precise set of actions. Unfortunately, those actions are not always in the best interest of the members in the supply chain, i.e., the supply chain members are primarily concerned with optimizing their own objectives, and that self-serving focus often results in poor performance. Optimal supply chain performance can be achieved if the firms coordinate among themselves by using contracts which offer the right incentives such that each firm's objective becomes aligned with the supply chain's objective. Pre-built Smart Contracts in marketsN are designed to capture different terms which can be used to incentivize performance across group members. These contracts are flexible and can be customized. In marketsN, contract enforcement is automated to reduce contract management cost, improve overall supply chain & procurement efficiency.

Pre-built Smart Contracts in marketsN are designed to capture different terms which can be used to incentivize performance across group members.

The ERP connector can be customized to interface marketsN with existing ERP deployments.

Interfaces

marketsN offers multiple interfaces to connect with existing and emerging technologies. The ERP connector can be customized to interface marketsN with existing ERP deployments. This extensible architecture allows easy integration with existing enterprise IT deployments and allows procurement managers & account departments to continue using the ERP user interaction paradigm. Organizations which do not use an ERP system may use marketsN directly via a web-based user-interface or a mobile app. This allows SME group members to immediately start using marketsN via a web browser (e.g. Google Chrome) without requiring any installation. A built-in connector interfaces marketsN with the public Blockchain (e.g. Ethereum). A public blockchain connector enables member organizations in a group to securely share a trusted copy of their digital assets with non-group members. For instance, an organization can share a trusted copy of its marketsN invoice with Banks or NBFCs in order to secure a low-risk, low-cost loan.

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Insights

marketsN contains off-blockchain analytics modules to mine data generated in the group. The data generated from inter-organization transaction in a group makes available new data which, till now, was distributed in siloes. Real time visibility of assets & processes across the group improves both oversight & accountability. Built-in Visualizations provide operational & strategic insights. marketsN uses machine learning algorithms to find patterns and deliver insights to supply chain managers, procurement departments & finance teams. Spend analytics helps determine where to improve and what targets to set. Unified evaluation helps assess performance and capabilities of member organizations across a balanced scorecard. Demand forecasting helps with capacity planning. A built-in marketbot mines this data to recommend actions in real time to improve group performance over the long run.

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Key takeaways

Transaction costs make economic networks inefficient:

- Search and information costs such as determining whether the required good is available, which has the lowest price etc.
- Bargaining costs required to come to an acceptable agreement with the other party, drawing up an appropriate contract etc.
- Policing and enforcement costs in making sure the other party sticks to the terms of the contract, and taking appropriate action if this turns out not to be the case.

marketsN enables integration of business networks to reduce transaction costs.

- By enabling the on-demand creation of trusted groups, marketsN makes it easy for organizations to transact with existing partners and add new ones – potentially entering new markets.
- By providing standard yet customizable transaction templates encoded as Smart Contracts, marketsN allows businesses to specify criteria such as minimum quality specs, due date etc.
- By embedding incentives & penalty terms in Smart Contracts, marketsN enables automatic enforcement. This reduces enforcement costs and enhances process transparency.
- By providing real time visibility combined with indisputable records of all changes in distributed inventory, marketsN prevents inventory fraud.
- By enabling a single view of processes, marketsN allows organizations to have oversight over transactions with other organizations, fix accountability and quickly identify bottlenecks.
- By analyzing both on-Blockchain & off-Blockchain data with built-in machine learning algorithms, marketsN makes in-context recommendations about optimal prices, vendor selection etc. This reduces search and information costs.
- By using a complex event processing system connected to the Blockchain, marketsN creates real time notifications to ensure that transactions complete quickly & smoothly.
- By maintaining an immutable (indisputable) record of all transactions, marketsN provides built in auditability which can be aggregated to automate reporting & compliance.
- By enabling a shared, trusted view of current & past transactions, marketsN enables banks & financial institutions to provide trade financing with minimal risk.
- By supporting multiple types of auctions on Blockchains, marketsN enables optimal price discovery. This reduces bargaining costs and enhances process transparency.

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About marketsN

marketsN is a solution by KoineArth.

KoineArth is a Singapore and India based company. KoineArth provides solutions to enable the creation of economic networks and markets using trusted information and incentives. At KoineArth, we bring the power of Blockchains, Machine Learning & Mechanism Design to solve real world problems in supply chains, sharing economies and public service delivery. Our solutions are optimal for settings which require process coordination and incentive alignment across multiple entities.

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