Tomorrow's
Value Chain

How **blockchain** drives visibility,
trust and efficiency
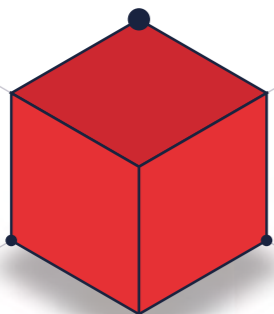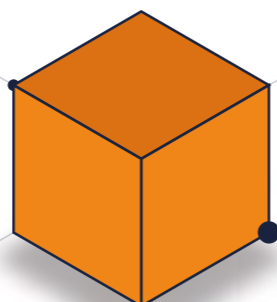
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The Consumer Goods
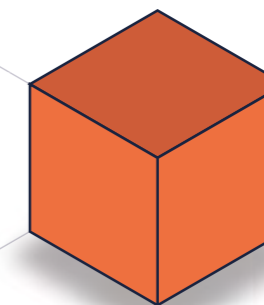**FORUM**
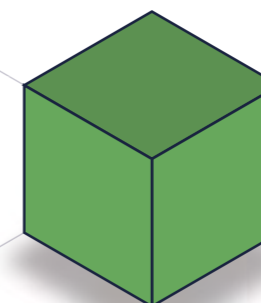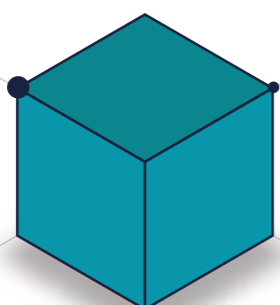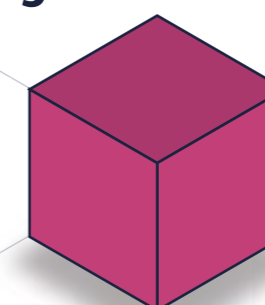
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Executive
Summary

Many traditional supply chain transactions remain inefficient, expensive and vulnerable. Blockchain, a transformational, inter-enterprise application, is at the forefront of solving these problems.

Blockchains – distributed ledgers that create an unchangeable and shared record of every transaction associated with an asset – create an unbroken chain of trust from source to consumer. Each record is time-stamped and appended to the preceding event. Blockchains are ideal for managing inter-enterprise processes, and have the potential to generate breakthroughs in three areas: visibility, efficiency and trust.

Blockchain provides all parties secure and universal visibility into all transactions to finally solve the supply chain problems that the industry has been facing for decades. As a trusted system of record, blockchains can also incorporate new data sources, such as the Internet of Things (IoT), and harness the power of cognitive computing so all ecosystem partners can make better decisions and increase efficiency. It solves the historic mistrust between organizations, including fear that information might be passed on to a competitor. Today, even when information is shared, it's often not fully trusted.

According to Gartner, Inc., blockchain is one of the top 10 strategic technology trends for 2017(1). Early adopters in the fast-moving consumer goods industry are already creating ecosystems and deploying blockchain to strengthen trust, transparency and efficiency in the supply chain.

Blockchain will fundamentally change how companies interact and do business together. In this report, produced for The Consumer Goods Forum and its End-to-End Value Chain Learning Series, IBM is delighted to share how this technology will impact the value chain for retailers and consumer goods manufacturers. We hope our insights will highlight the value blockchain can bring to your organization and help you get started on this transformational journey.

What is blockchain?

A blockchain is a distributed ledger that records transactions among multiple parties efficiently and in a secure, permanent manner. The ledger is a trusted inter-enterprise system of record for all permissioned parties in a business ecosystem. Each party agrees to the network-verified, transaction-ensuring consensus. The blockchain provides complete visibility to parties' transactions and ensures security and authenticity. (See figure 1). The parties can use smart contracts that enable automated transactions without the need for intermediaries or delays.

Blockchain establishes a 'single version of the truth' beyond the bounds of just a single enterprise to include the entire ecosystem. All parties in the blockchain can authenticate the data they share, including manufacturers, suppliers, distributors, transportation providers, retailers, banks, and governmental agencies. Anything that can be digitized can be put on the blockchain from product codes and serial numbers to contracts, images, videos and more. It can reveal where an asset is at any point in time, who owns it or is handling it, and what state it's in.

Blockchain's trusted system of record allows for unprecedented collaboration for inter-enterprise processes. Without compromising the security or competitive advantage of their own company, supply chain professionals can access the information on transactions they need to quickly make smart decisions. It is relatively straight-forward for ecosystem participants to integrate easily into the blockchain using standard application program interfaces (APIs) and open-source technology.

A blockchain that is open and ready for business will contain the following capabilities:

Shared Ledger[1]

The core of blockchain is a shared, distributed ledger among an ecosystem of partners. The shared ledger creates a single system of record or single version of the "truth". It is an append-only ledger of digitally signed and encrypted transactions that is replicated across a network of peers.

Smart Contract[2]

Smart contracts contain business logic that is attached to transactions. Smart contracts encapsulate participant terms of agreements for the business that takes place on the network; they are stored on the validating nodes in the blockchain and triggered by transactions. This automates business processes that cross organizational boundaries in a secure and decentralized manner.

Privacy[3]

Blockchain provides a private, secure network for transactions in which all parties have complete visibility. The privacy of the blockchain ensures confidentiality, authenticity and security of each transaction.

Consensus[4]

Instead of relying on a third party, such as a financial institution, to mediate transactions, members in a blockchain network use a consensus protocol to agree on ledger content, and cryptographic hashes and digital signatures to ensure the integrity of transactions. Consensus ensures that the shared ledgers are exact copies, and lowers the risk of fraudulent transactions, because tampering would have to occur across many places at exactly the same time.
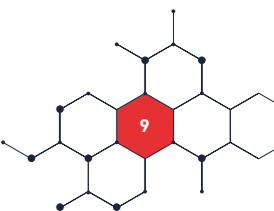
By providing a single version of all transactions, blockchains provide the visibility all parties need to make better decisions throughout the product lifecycle, improve efficiency through automation and ensure trust for suppliers as well as consumers that products are safe and authentic.
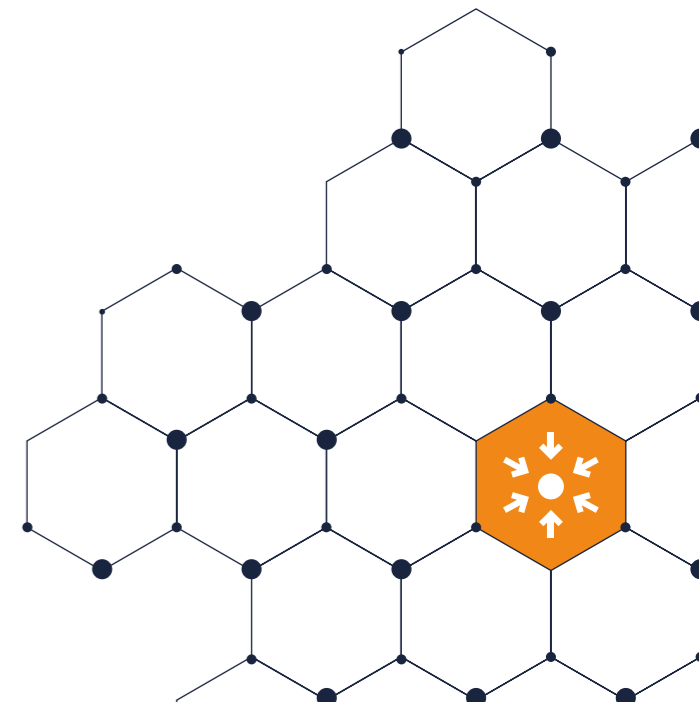
Impact on the Supply Chain

Figure 2

While today's supply chains are increasingly complex and diverse, they are still riddled with inefficiency and rely heavily on paperwork, manual processes and hundreds of people to perform tasks.

Clearly, this represents an immense challenge that will require companies to have universal insight into goods throughout the chain, re-imagine their processes and integrate with partners across the supply chain more than ever.

Blockchain provides a transformational opportunity for enterprises to address these challenges by:

Saving time and cost[1]

Blockchain can reduce transaction times from days to seconds, it also eliminates the need for intermediaries to resolve disputes and reduces overhead costs.
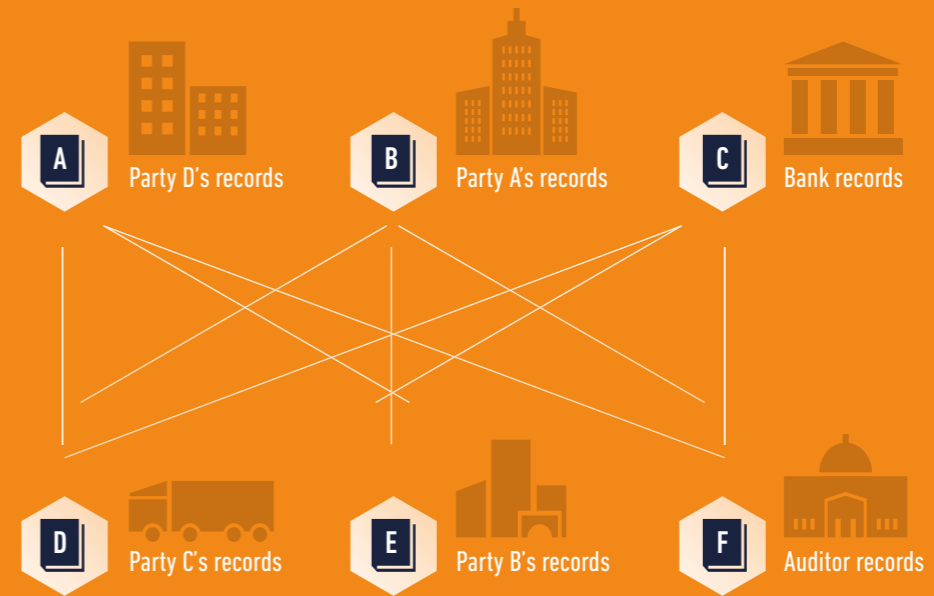
Reducing enterprise risk[2]

Blockchain gives greater traceability, allowing companies to ensure product authenticity and safety, limit fraud and reduce over- and under-stock situations.

Increasing trust between suppliers, partners, and consumers[3]

With shared processes and systems of record, all parties reach consensus on every transaction. Blockchain gives increased transparency, leading to better decisions for suppliers, proven provenance for products and greater consumer confidence.

Blockchain has the potential to change many fundamental processes in the consumer products and retail supply chain and will support an unprecedented level of visibility, process optimization and collaborative demand management.

A — Party D's records
B — Party A's records
C — Bank records
D — Party C's records
E — Party B's records
F — Auditor records

THE
DISTRIBUTED LEDGER

Party D's records
Party A's records
Bank records

Party C's records
Party B's records
Auditor records

Distributed ledgers can become the foundation of a robust system of trust, **a decentralized platform for massive collaboration.**

SHARED > **REPLICATED** > **PERMISSIONED**

Blockchain at work in the Value Chain

Using blockchain to improve supply chain visibility

In the digital world, consumers are demanding accurate, real-time inventory information, faster service and low or no-cost shipping. This requires a transparent, efficient and agile supply chain. Estimates of the impacts of lack of supply chain visibility are around $300 billion globally, with even greater top and bottom-line impact due to out-of-stocks and transportation inefficiencies.

In addition, there are significant threats to businesses. The advent of eCommerce requires retailers to be accurate with their forecasting, merchandising and assortment, or face losing business to their competitors. Brick and motor retailers are under increasing pressure from e-commerce companies. This is exemplified by Amazon and its drive to deliver a wide range of products faster to the consumer. To achieve this degree of speed and agility, companies will face increasing pressure to:

• improve demand forecasting
• reduce transportation costs
• reduce out-of-stocks and
• ensure high levels of customer satisfaction.

Clearly, this represents an immense challenge. It will require companies to re-imagine their processes and integrate with partners across the supply chain more than ever before.

The technology

As shown in Figure 3, the exchange of inter-enterprise information has traditionally been through EDI and portals. In some cases, these transactions are still paper-based or use tools such as Excel or e-mail. While EDI does an excellent job of providing point-to-point messaging for this exchange, it needs to be supplemented by tools within each enterprise to provide context and status. Each enterprise may have its own version of the truth, so these versions will have to be reconciled periodically to arrive at the true picture and settle transactions. And, since the EDI transactions are between two parties, the rest of the partners in the supply chain are unaware of the transaction. Any planning they do is merely reactionary.

For example, when a retailer transmits an order to the manufacturer, the retailer is often unaware of when the transport company moves the product from supplier to the retailer's distribution center (DC). The retailer can only confirm when it receives the goods in the DC.

As shown in Figure 4, these inherent lags can be addressed with blockchain technology. As a shared ledger, blockchain allows the retailer, supplier and transport companies to work off the same data – a single version of truth. As each partner updates the block, the trusted, real-time data can be used to optimize forecasting and transportation planning.

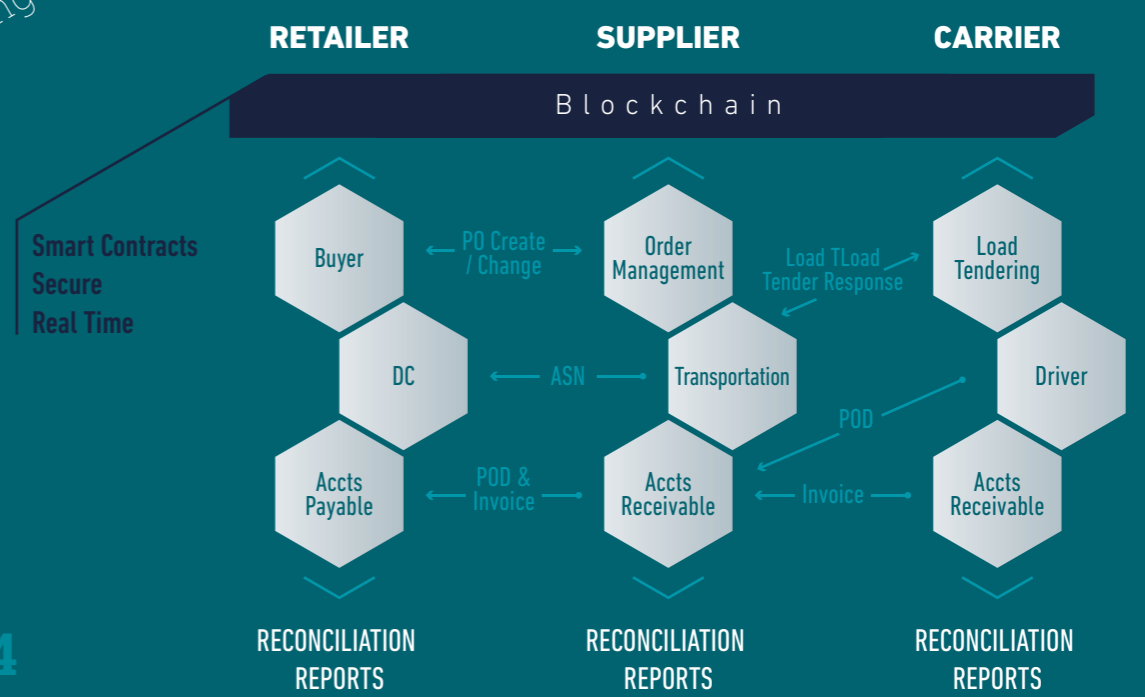Blockchain at work in the Value Chain
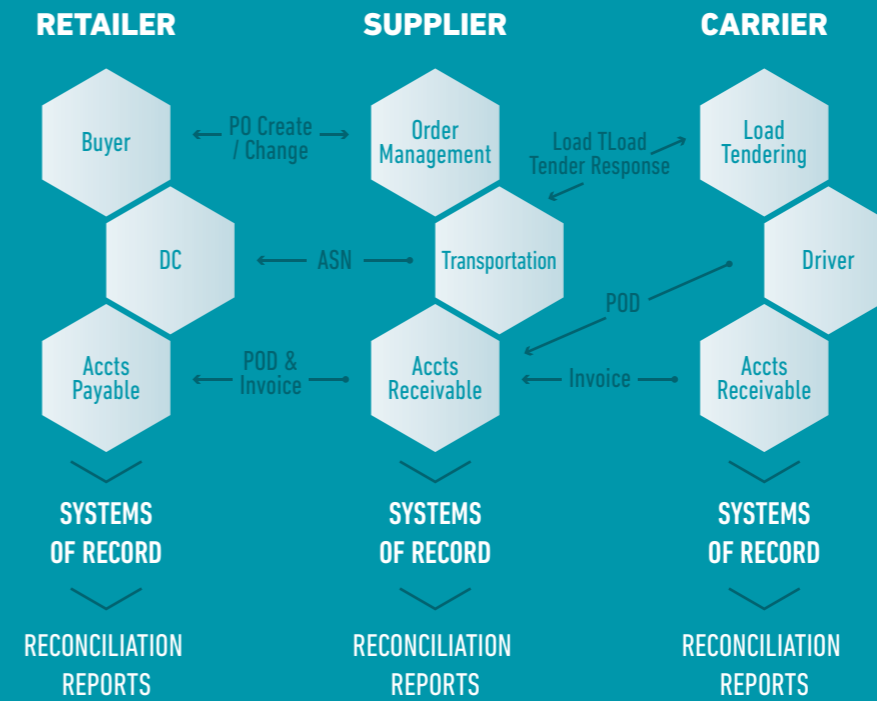
Figure 3

Traditional, based on EDI

SUPPLY CHAIN

Using Blockchain

Figure 4

Improving food safety, traceability and trackability

Providing transparency is critical to keeping the trust of everyone in the ecosystem, from suppliers and consumers. Consumers increasingly demand to know more information regarding where products are made and what they contain. Ultimately, consumers want to ensure that the food they consume is safe.

In the U.S. alone, it is estimated there are about 48 million food-borne illnesses of which 128,000 require hospitalization(2). To prevent outbreaks of these illnesses, regulators are increasing the requirements for tracking products through the entire supply chain to improve food safety. This is essential to a company's ability to meet food safety requirements and rapidly react to product recalls.

With blockchain, food products can be digitally tracked at every stage of the value chain from suppliers to store shelves and ultimately to consumers. Digital product information such as farm origination details, batch numbers, factory and processing data, expiration dates, storage temperatures and shipping details are digitally recorded in the blockchain.

Each piece of information can provide critical data points that potentially reveal food safety issues with the product. Equally as important, the information captured in each transaction is agreed upon by all members of the business network. Once there is a consensus, it becomes a permanent record that cannot be altered.

This permanence ensures that all information about the chain is accurate. The record created in the blockchain can also help retailers better manage the shelf-life of products in individual stores and further strengthen safeguards related to food authenticity.

The Technology

In traditional supply chains, companies typically capture data on batches of product using a combination of systems and manual paper trails. If a company must recall its product, it is a cumbersome process, laden with inefficiency and inaccurate data. The average recall costs roughly $10 million in operational costs alone, not including damage to brand reputation and loss of sales. In addition to the fragmented data, companies must support disparate regulatory requirements. The regulations may be country-specific, category-specific and in some cases, differ among the regions of the same country.

With its distributed network architecture, blockchain is uniquely positioned to improve visibility and collaboration across the supply chain. Retailers, suppliers and distributors can append any type of data including pictures, video, periodic feeds from sensors, etc. to the blockchain network for their areas of responsibility. This creates an end-to-end view of an individual lot all the way from the source to the consumer. This data is shared transparently across the entire network.

The proof of work is authenticated based on consensus. This ensures the data is accurate, verifiable and trusted.

Reducing fraud and establishing authenticity for high value luxury goods

Proving authenticity and transparency is essential in the world of consumer products and retail. This is particularly true for high-value, luxury items. Without a strong regimen for authenticity, companies are vulnerable to fraud and theft. Some estimates say counterfeit products may cost the global economy up to $250 billion a year(3). In the jewelry market alone, the cost of fraud to insurers tops $2.5 billion a year (4).

By creating a chain of data that cannot be altered, blockchain is well-suited for tracking high-value, luxury goods and other items where buyers want full insight into the origins and ownership trail of the goods. Strong confidence in product authenticity and provenance can significantly raise consumer trust and brand reputation over time.

The Technology

Using current paper-based processes, it is very difficult to prove authenticity in high-value goods such as diamonds. Instead, with blockchain, clear product attributes can be captured and registered using consensus. By entering photographic images, scans, and inspection results on the blockchain, confidence in authenticity and full trust can be obtained.

Blockchain traces meat products

What

A practical way to envision a blockchain is in tracing meat products from the farm all the way to the consumer. Consider the many steps in the process from shipping livestock to processing and packaging the meat and finally to stocking in supermarket shelves. This process is laden with regulations, storage & transport requirements, and handoffs from suppliers and partners.

How

Each transfer is registered on the blockchain. The slaughter house updates the blockchain with the data regarding the lots that are created based on a single animal. Batches or lots are then shipped to consumer product companies as raw materials. The movement of these batches are cataloged by the transport company, while the manufacturing company updates the blockchain with data that records where these lots were consumed and the finished good's batch number. The final step is the transfer of the product to the retailer through the distribution network. At each step of the process important data can be entered into the blockchain, creating an unchangeable record of the flow of a batch or lot.

Benefits

- Improved track & trace capabilities for the consumer & industry result in decreased response time to product recalls
- Enhanced food flow has material impact on shelf life management
- Lower compliance costs

Blockchain provides real time visibility

What

By capturing the real-time GPS position of delivery trucks, companies can redirect the truck based on out-of-stock situations at individuals stores. Knowing the latest status of a purchase order can help improve truck utilization for the transportation company, while also enabling the retailer to improve forecast accuracy.

How

Since the blockchain can capture both structured and unstructured data (images, video links, sensors), it can enable clearer communication and documentation. This further reduces disputes between parties as to what really happened – in turn saving time and money while enabling the service provider to get paid on their invoices faster.

Benefits

- Trusted & holistic view into goods arriving allowing for more effective & faster order fulfillment
- Decrease in dispute resolution time
- Proof of delivery to meet delivery requirements by vendors
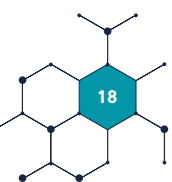
Using blockchain to track global trade and shipments

With increasing the number of small suppliers scattered around the world, international trade is becoming more complex. Organizations such as banks, importers, exporters, ports, customs agents, terminal operators and shipping / transport companies are all involved in the various "touch points" of international trade. Yet even with an abundance of data, blind spots are many:

- Has our supplier sent a full order?
- Are we missing documentation?
- Did the ship depart the port on time?

The paperwork in some current processes is very labor and time intensive – often never digitized. One major shipping company cites that 15% of their import/export cost is spent on air courier for customs paperwork alone. Paper documents in some countries are hand-carried to government offices for stamps or authorization and flown across international borders for presentation at the customer's location. Various documents could be involved, including letters of credit, bill of ladings, customs documents and more.

In many shipping scenarios, processes and systems have been developed in more-or-less "in-country silos." Current manual processes — such as labor, courier or other manual expenses — can add up substantially across these silos. The digitization and sharing of this documentation provides trust, authenticity, and efficiency.

With blockchain, one of the key aspects of adding documents to the shared ledger is the consensus step. All the parties can participate in building consensus and can agree to the rules by which the transaction and documents posted must comply. See Figure 5 below to view a sample dashboard.

Figure 5

Blockchain can assist in various international trade processes

Visibility into the state of shipments and state of goods can be recorded.

| Malay Bank | Malay Grower | Logged on as Port Kelang | Port of Hamburg | Berlin Customs | Berin's Fresh Cuts | Berlin Bank |

INTERNATIONAL SHIPPING

Although in the early stages, benefits are beginning to play out for those using blockchain in international trade.

These include:
- Authorities, shippers and freight forwarders can have a shared view of the state of documents.
- Digitally-signed documents are harder to forge than paper documents.
- Manual courier or labor expenses can be substantially lowered or eliminated.
- Customs processes can be expedited.
- Process notification of the next participant in a workflow can be automated, rather than requiring human intervention.

Additionally, as banks get involved in the chain, conditioned payment can be further automated using smart contracts. As a result, remittance times can be shortened significantly.

Blockchain at work in the Value Chain

Blockchain Certifies Flowers

What

Sending a bulk shipment of flowers overseas can generate dozens of documents. The document that certifies flowers to be hygienic and insect-free must be stamped and signed by numerous parties. It must then be transported by air to the import destination because customs agents do not trust a scanned version. One small error could result in significant delays.

How

Costs can be lowered using a blockchain approach to create a digital chain of paperwork and documents. It also builds trust as partners in the supply chain can precisely track the location of the containers during their international journey. And, they have the security of knowing the condition of goods as they cross borders and change owners.

Companies can also embed logistics rules in the blockchain, such as the temperature range and humidity range for the shipment. Thermometers or sensor devices can record data on the temperature and humidity throughout parts of the blockchain to ensure compliance to these standards for product acceptance.

Benefits

- Increase speed of resolution
- Air courier expense eliminated
- Various customs paper processes digitized
- Opportunity to add IOT for sensing condition of goods

Blockchain authenticates jewelry

What

Using blockchain and smart contract technology, a company called Everledger can provide B2B traders, insurance companies, consumers and others with a trusted history of a diamond's authenticity and ownership that cannot be changed.

## How

Once a diamond is registered on their blockchain, the permanent records provide a clear audit trail to reduce fraud, theft and trafficking. Diamond certification houses can capture detailed diamond characteristics on more than 40 data points, such as carat, cut, color and clarity. They can then link this information to a laser inscription on the bottom of the stone.
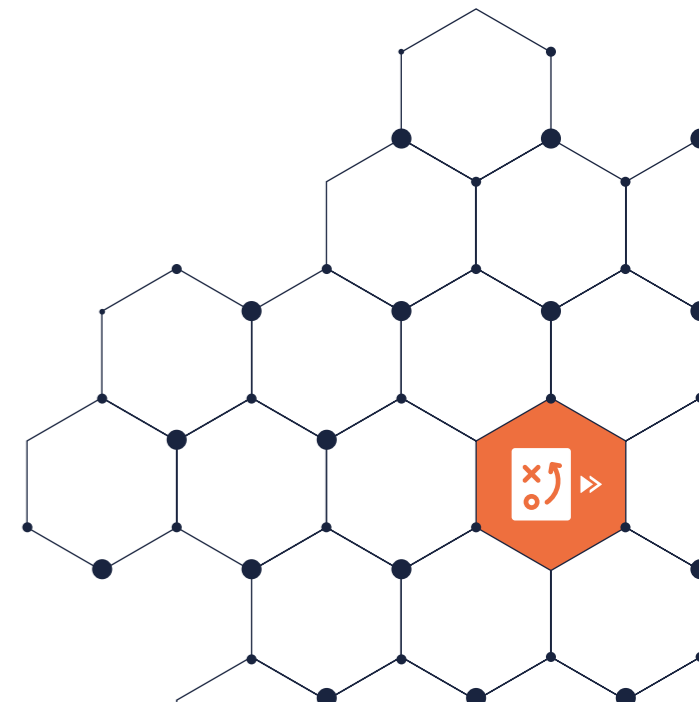
Combined with high definition photography, all this data is written into the blockchain creating a permanent, digital thumbprint of the item.

Benefits:

- Minimize fraud – 65% of fraudulent crimes go undetected
- Address problems of double financing
- Reduce amount of conflict stones through improving identifiability
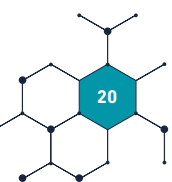
Looking beyond the Value Chain

Blockchain represents a new way to collaborate and conduct business. It provides trust and transparency in a world that sometimes is lacking in both. These attributes make it an ideal solution for many uses including supply chain visibility, trust and efficiency. Wherever there is friction across interdependent, inter-enterprise processes, blockchain can help.

In enterprises there are often a number of siloed departments that must complete reconciliations of complex transations. They are typically fraught with friction and disagreements in departments such as:

1 *payables processing*
2 *dispute management*
3 *loyalty program management*
4 *trade promotions management*

Entities that are global often have multiple operating concerns that require harmonization. This can often require numerous accounting teams to manually reconcile the transactions and ensure integrity in the operations and accurate financial reporting.

Any instance where there are duplicate data and tasks or a lack of trusted data are ripe for the kinds of disruption and reinvention possible using blockchain.

1

2

3

4

Future adoption in the industry
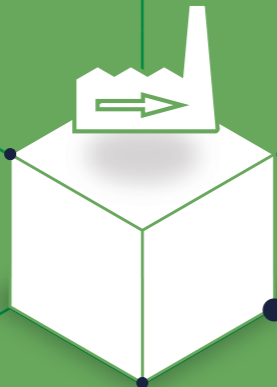
Driven by initial deployments, block-chain will gain traction in the industry with market innovation leaders, industry groups and, in some cases, regulatory organizations. IBM's Institute of Business Value projects that 15% of the market will have block-chain initiatives in production in 2017.

By 2018, we expect substantial momentum in blockchain implementations for consumer products and retail companies globally. By 2020, we expect that nearly two-thirds of the retail and consumer goods industries will have blockchains in full production.
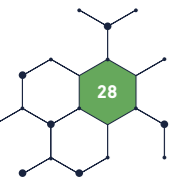
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to get
started
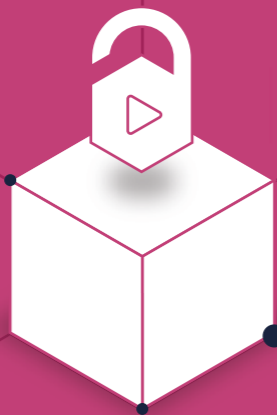
Blockchain is a powerful tool in establishing trust and transparency, creating visibility and driving efficiency. The greatest benefits will be realized when ecosystems participate in a shared system of record from source to consumer.

To get started with blockchain technology, we recommend that retailers and consumer goods companies do the following:

Identify a lead blockchain opportunity[1]

Identify the most compelling use cases by considering where blockchain might provide the highest value for your organization. Experiment with blockchain technology where the attributes will drive rapid impact.

Select a project to get started[2]

Consider focused proofs of concept and incrementally expand scope for major business results. Identify ecosystem partner(s) with whom you can collaborate.

As shown in Figure 6, three core principles are at the core of blockchain for successful use in business ecosystems.

Scale your enterprise and ecosystem

Use insights from earlier, more limited projects to implement larger efforts through process re-engineering and systems integration.
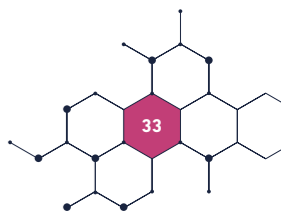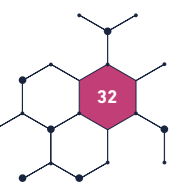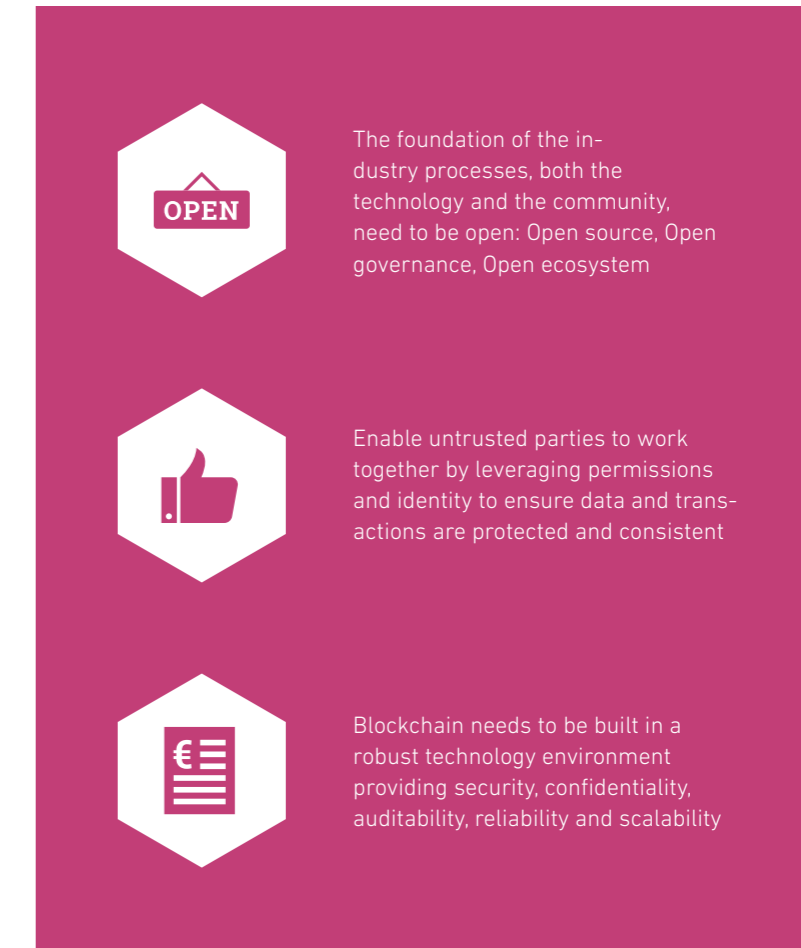
Leverage data for collaboration[3]

Leverage blockchain to collaboratively improve demand forecasting and inventory optimization. Once a trusted system of record is in place, new data sources, connected devices and cognitive computing can be applied for even greater benefits. Supply chain professionals will be able to improve collaborative demand forecasting, reduce disruptions, speed processes and significantly decrease all types of waste and fraud. This will drive even more agility, efficiencies and trust.

Expectations from consumers and partners have never been higher. Today's enterprise needs the ability to move quickly, nimbly, and securely to keep up with the pace of the market. With blockchain, your organization can create the value chain of tomorrow today.

Learn more at
www.ibm.com/consumerproducts

Figure 6

Three core principles of blockchain

OPEN

The foundation of the industry processes, both the technology and the community, need to be open: Open source, Open governance, Open ecosystem

Enable untrusted parties to work together by leveraging permissions and identity to ensure data and transactions are protected and consistent

Blockchain needs to be built in a robust technology environment providing security, confidentiality, auditability, reliability and scalability

About

About IBM

For more than a century, IBM has been providing businesses with the expertise needed to help consumer goods companies win in the marketplace. Our researchers and consultants create innovative solutions that help clients become more consumer-centric to deliver compelling brand experiences, collaborate more effectively with channel partners and align demand and supply. For more information on our consumer product solutions, see www.ibm.com/consumerproducts

With deep industry expertise and a comprehensive portfolio of retail solutions for merchandising, supply chain management, omni-channel retailing and advanced analytics, IBM helps deliver rapid time to value for our clients. We help retailers anticipate change and profit from new opportunities. For more information on our retail solutions, please visit: www.ibm.com/retail

About The Consumer Goods Forum

The Consumer Goods Forum ("CGF") is a global, parity-based industry network that is driven by its members to encourage the global adoption of practices and standards that serves the consumer goods industry worldwide. It brings together the CEOs and senior management of some 400 retailers, manufacturers, service providers, and other stakeholders across 70 countries, and it reflects the diversity of the industry in geography, size, product category and format. Its member companies have combined sales of EUR 3.5 trillion and directly employ nearly 10 million people, with a further 90 million related jobs estimated along the value chain. It is governed by its Board of Directors, which comprises more than 50 manufacturer and retailer CEOs.

For more information, please visit: www.theconsumergoodsforum.com.

Authors

Brigid McDermott, VP Blockchain Business Development, IBM

Kaushik Malladi, Associate Partner, Retail & CPG Center of Competence, IBM Global Business Services

Kevin Abele, Solutions Manager – Consumer Products, IBM Global Markets

Jake Harkins, Portfolio Marketing Manager, IBM Global Consumer Industry

Contributors

Laurence Haziot, Global Managing Director, IBM Consumer Industry

Steve Laughlin, Global Industry General Manager, IBM Consumer Industry

Patricia Waldron, Global Director, Distribution Sectory Industry Marketing

Nikos Kourtis, VP, Business Development – IBM Consumer Industry

Chris Davin, Partner & VP, Senior Client Partner, IBM Global Business Services

Stephen Leng, Senior Managing Consultant, IBM Global Business Services

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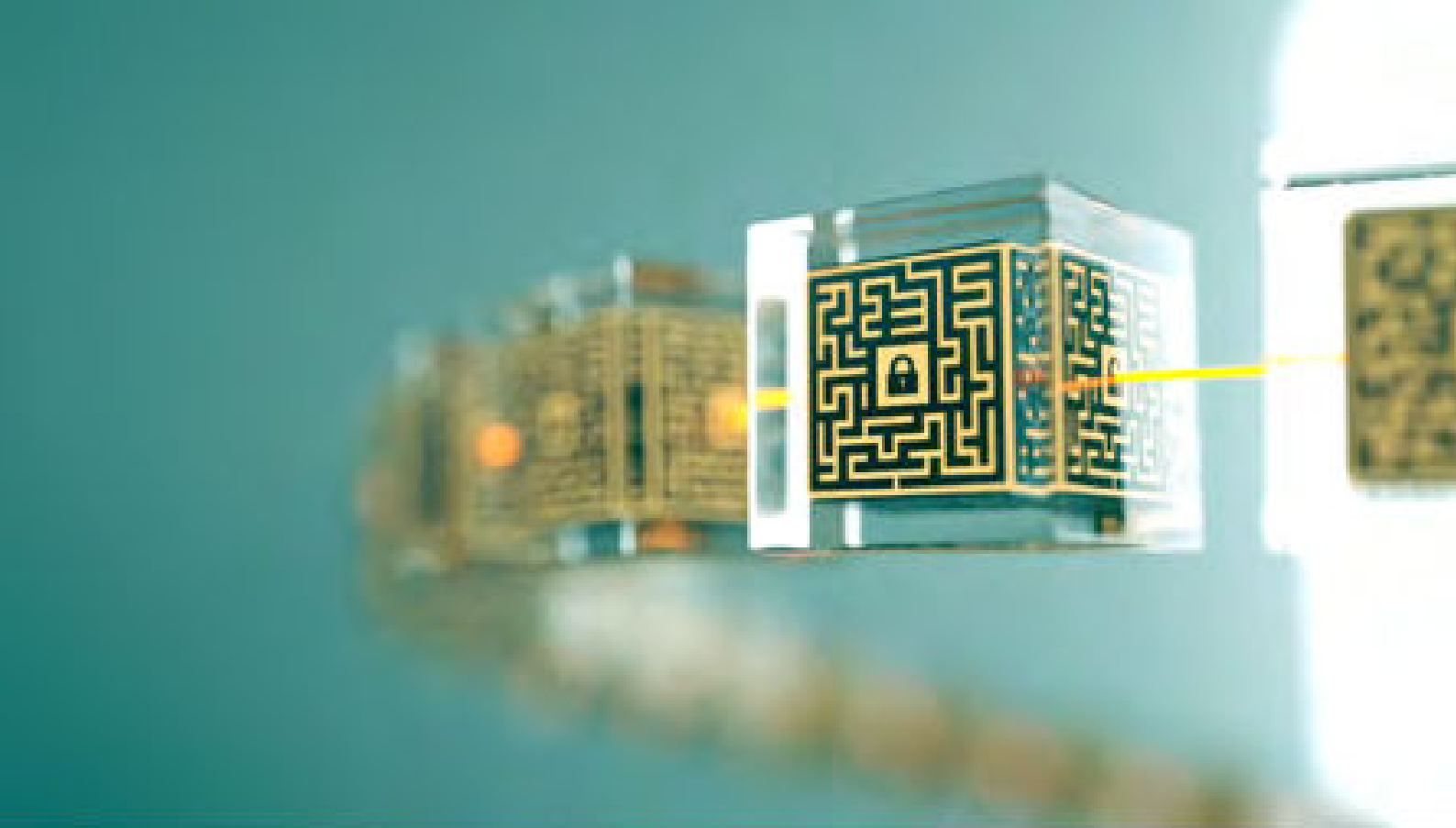USA Today, 9 most counterfeited products in the USA, March 29, 2014.
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