

White Paper

Know Your Product: Blockchain-Enabled Product Stewardship

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EXECUTIVE SUMMARY

Blockchain technology holds the promise of significantly transforming industry value chains, and this has created genuine interest in investing in early use cases. In manufacturing and retail, the use case that is generating the greatest amount of interest is eliminating counterfeiting and improving product quality. Many of the mentioned use cases in this white paper can be collectively referred to as "know your product" (KYP) and look at the considerations involved in building the business justification for this investment. Key findings include:

- Counterfeit products represent over \$1 trillion in lost revenue for industry (excluding software piracy). Industries such as luxury goods, pharmaceutical, and consumer electronics are most impacted.
- Product quality issues are tied to huge losses including remediation, regulatory penalties, and brand damage. Dramatic examples such as faulty airbags and tainted food generate headlines, but the problem is widespread and includes a number of smaller incidents as well.
- Addressing quality issues has historically been difficult because record-keeping across supply chains is poorly coordinated and the opportunity to tamper with or destroy records is too prominent. Blockchain represents an opportunity to create synchronized, immutable records that form the basis for improved performance.
- Creating the financial justification for eliminating counterfeiting hinges on capturing loss revenue, which can range from 2.5% to 8.5% of a company's top line, depending on industry. In industries such as luxury goods, this includes return fraud where the knock-offs are so good that retail outlets accept them as returns and issue refunds.
- Justification for product quality relates to opportunities for lowering the probability of an adverse event and for lowering the impact from an incident. Human safety and brand damage are harder to quantify but should be included.

IDC recommends that companies begin with an articulation of the supply chain processes involved as well as the key participants, including platforms, technology providers, and regulators. At the outset, look for a service provider that not only understands the technology but also brings the requisite industry knowledge that will be invaluable in creating a proof of concept and moving you forward to scale.

The Emerging Use Case for Blockchain: Product Traceability

Blockchain is generating tremendous conversation as a technology topic as companies, technology providers, and service providers try to find the best use of this versatile technology. And all the hype is warranted. Blockchain is the foundational technology on which Bitcoin is built, but the enterprise discussion quickly separates Bitcoin out as only moderately interesting and focuses on the ability of blockchain to ensure trust and exchange value across value chains.

Blockchain at its core is a consensus algorithm that enables distributed record-keeping with assurances that those records have not been tampered with – they are immutable. The distributed and automated nature of the technology creates the potential to deliver tremendous value for use cases that otherwise would require a central authority or trusted intermediary. For the former, blockchain provides synchronous transaction processing, which eliminates the need for costly data exchange and reconciliation. For the latter, blockchain offers the potential for substantially lowering the transaction costs charged by those independent intermediaries.

Although conceived and nurtured in the financial services industry, supply chain applications have quickly surpassed all other areas, more specifically the opportunities around improving product traceability, what the industry is calling "know your product." The intent of this white paper is to provide readers with the essential elements of creating their own business case, including the financial justification, who from the value chain needs to be involved, what needs to be built, and how to build it.

KYP Initiatives Can Yield Substantial Returns

The ability to trace the full genealogy of every product a company produces as well as the provenance of the ingredients and materials used opens up a wide range of opportunities for business benefit. There are basically two categories of benefits: anti-counterfeiting and product quality.

The Genuine Article

Estimates of revenue loss to U.S. companies as a result of counterfeit goods run from \$200 billion to \$600 billion. IDC pegs the number worldwide at over \$1.1 trillion excluding software piracy. While most think of this as a problem in luxury goods, the issue is prevalent in several industries:

- **Luxury goods.** This is the industry with the most visible losses. Anyone who has visited the marketplaces in Hong Kong can attest to the wide availability of apparel, footwear, watches, and jewelry that come amazingly close to the genuine articles. Luxury goods account for more than one-third of the annual losses from counterfeit goods. If your company doesn't have data available on lost revenue, IDC recommends luxury brands plan on achieving a revenue uplift of 8.5%.
- **Aerospace parts.** Although the aerospace industry doesn't publish lost revenue data, the Aerospace Industries Association has estimated that the number of incidents in the United States alone in 2016 exceeded 10,000. IDC estimates that the loss approaches \$450 million worldwide. Most of the counterfeit activity is tied to electronic parts, particularly integrated circuits. IDC recommends companies use 2.5% as the basis for additional revenue.
- **Automotive parts.** The Motor and Equipment Manufacturers Association estimates revenue losses in the United States at over \$3 billion. IDC believes this number is very conservative and estimates the global number to be closer to \$90 billion. IDC recommends using a 3% revenue increase in justifications.
- **Consumer electronics.** With revenue losses of \$250 billion, the consumer electronics industry is second only to luxury goods. In this industry, smartphones are the most victimized, but activity has also been discovered in categories such as gaming systems. Revenue increases of 7% are a reasonable expectation.
- **Life sciences.** Despite heavy regulation, counterfeit drugs represent more than \$200 billion in lost revenue. In addition, medical device manufacturers must deal with the potential for counterfeit parts and consumables. Pharmaceutical companies should plan for a 4.5% revenue increase, while medical device manufacturers should target a 3% revenue increase.

There are a number of emerging use cases as well. The growing use of electronics in a wide range of products is increasing the vulnerability of using counterfeit integrated circuits. Also, the increased use of 3D printing is creating a requirement to validate that the design to be printed is genuine.

Return Fraud

Some counterfeit items are astonishingly good copies. In the luxury goods sector, this creates a vulnerability to return fraud. A counterfeit product is returned to the retail outlet for a full refund, for some goods amounting to thousands of dollars. The returns may be highly coordinated by organized crime syndicates or could be a consumer who believes the product is genuine. Return fraud is a large component of the losses incurred by the luxury sector.

Surveillance and Regulatory Costs

Efforts to mitigate revenue loss from counterfeiting are not inconsequential. The processes usually involve people-intensive investigative approaches. Efforts to automate have been hampered by the difficulty in getting the various players in the value chain to collaborate at a detailed level. The distributed ledger capabilities of blockchain overcome many of these challenges. Expect to reduce mitigation costs by 40% while also improving the accuracy and timeliness of record-keeping.

In cases where consumer safety is at risk, regulators impose oversight that can be an expensive compliance proposition. Life sciences, aerospace, and automotive industries carry the highest burden. Including regulators in the blockchain network can reduce the cost of regulatory reporting and response by 60%.

Product Safety

Beyond the revenue recovery and cost reduction opportunities of eliminating counterfeiting, companies are genuinely concerned with potential impact on human lives. Although there is little evidence of an actual catastrophic aircraft incident relative to a counterfeit part, there is ongoing concern within the industry of this possibility. The pharmaceutical industry is tremendously impacted in this area. It was recently reported that nearly 280,000 deaths, including 180,000 children, in emerging economies were the direct result of counterfeit malaria and pneumonia medication. Companies express a genuine responsibility to eliminate this problem.

Brand Damage

The presence of counterfeit goods in the market can do substantial harm to a company's brand. Recent examples include:

- **Tata Motors.** The availability and subpar quality of counterfeit spare parts in India were impacting consumer perception of overall quality and led Tata Motors to launch a substantial investigation and interdiction.
- **Louis Vuitton.** The venerable luxury brand has been facing counterfeiters since its inception at the beginning of the 20th century. The company has a zero-tolerance policy because it believes that anything else creates a slippery slope of sustained brand damage.

It can be difficult to calculate the financial impact of brand damage with any accuracy, so IDC recommends that this be communicated as a soft benefit when building justifications.

Product Quality

Consumers want to know that brand owners and retailers are keeping their promises – locally sourced or non-GMO food for example. They also want to know that the products they are buying are safe. There are numerous examples of companies that have been severely impacted by adverse quality events. The following cases represent a small sample:

- **Conagra.** A salmonella outbreak from tainted Peter Pan peanut butter in 2006 sickened more than 600 people in 47 states. Conagra recalled product from as far back as 2004 because it didn't have good traceability on ingredients. The incident cost the company over \$10 million in damages and substantial market share, which has not been recovered.
- **Chipotle Mexican Grill.** This restaurant chain was impacted in 2015 by an E. coli outbreak that infected 55 people. Despite major investments in new food safety procedures, a recent survey by UBS found that consumers are eating at the chain less frequently due to lingering concerns.
- **Takata.** A faulty mechanism in the company's automotive airbags led to multiple deaths, millions of cars recalled, and tens of millions of dollars in cost. The company filed for bankruptcy protection in June 2017 due to the impact.
- **General Motors.** A faulty ignition switch caused over 100 fatalities and twice as many injuries. The switches were installed in over 2.6 million cars.

In each of these cases, a lack of visibility across the value chain from supply through retail magnified the impact even if the adverse event couldn't be prevented.

Surveillance and Regulatory Costs

Another important element of product quality is the mitigation of regulatory risks such as labor rights or conflict minerals violations. Ensuring compliance is an expensive proposition, usually requiring third-party audit firms. Assuring regulators and socially conscious consumers that the company complies with these initiatives is an important element of product quality.

So Why Do You Need Blockchain?

There have been substantial investments in establishing product stewardship to combat counterfeiting and ensure quality and compliance. There are two primary roadblocks to doing this successfully. The first is the need for a central authority (usually the brand owner) to coordinate data collection and reconcile those records for a clear view of the product throughout its life cycle. The second is the ability of participants to alter records in the process without detection. Because of both the cost to implement and operate and the unreliability of the record-keeping, many of these efforts have fallen shy of expectations, with projects either ending up over budget or underperforming.

So how does blockchain enable these business benefits and overcome these challenges? IDC often suggests that the first question a company should ask when presented with a blockchain opportunity is "Why do I need blockchain to do this?" In the case of know your product, blockchain is a superior approach to the alternatives that have been unsuccessful in the past.

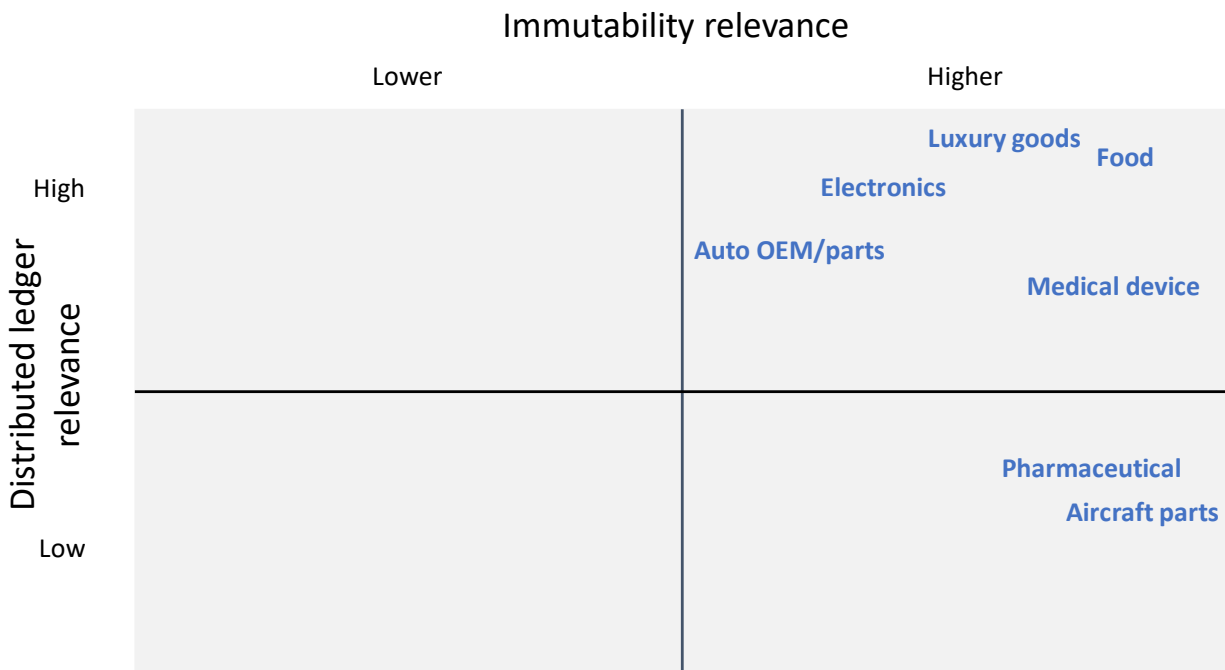
The most important element that blockchain brings to the application is the creation of a single source of the truth for the whole value chain. The distributed ledger capability ensures that every transaction is posted to the network for all the participants to review rather than requiring each individual company to keep its own records (see Figure 1). Since the brand owner is the root node, they can control who gets to see what and ensure that trade secrets are secured.

Another important element is that the records in the blockchain are immutable. They can't be altered, which provides assurances that all of the records are reliable. The brand owner can open the records to regulators and law enforcement to speed reviews and investigations.

These two elements of blockchain overcome the record-keeping challenges of previous attempts. The challenge is the relative immaturity of the technology. The service partner chosen to assist in the implementation should bring experience in deploying blockchain networks.

FIGURE 1

Industry Relevance to Distributed Ledger and Immutability



Source: IDC, 2018

Building the Justification

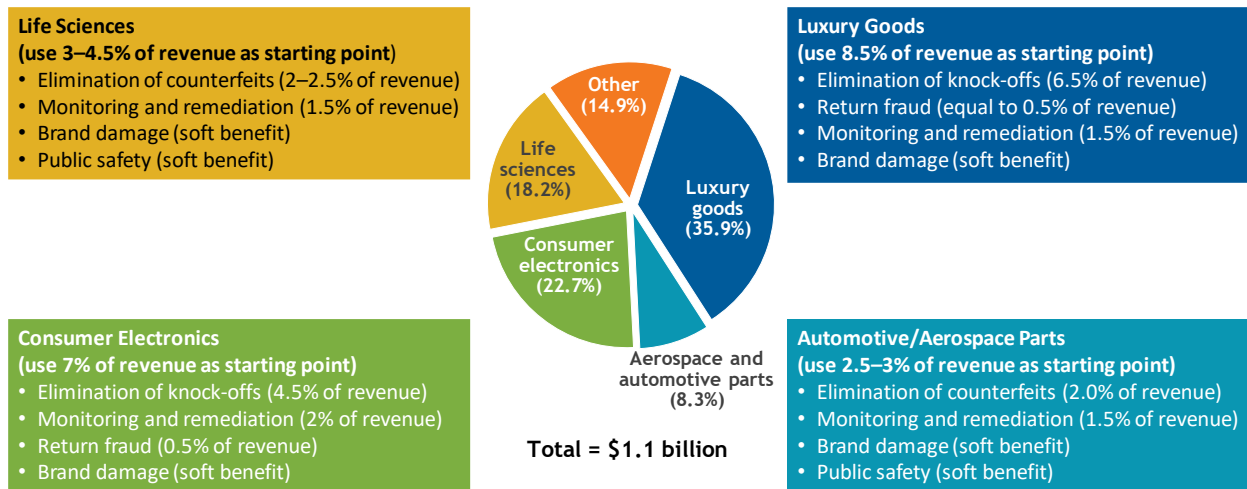
Anti-Counterfeiting

Use the revenue associated with the products that will be tracked in the project as a starting point, and calculate the potential increase based on company data or the IDC estimates discussed previously. Including cost savings can be tricky because much of the cost is related to personnel time; unless there will be actual staff reductions, see if the revenue increases justify the investment and use cost/time savings as a secondary benefit. Brand damage can be a less quantified tertiary justification. Figure 2 provides some guidance by industry.

Once the benefits are identified, work with a service provider to build an estimate of the cost to implement and operate a blockchain. The technology is relatively nascent, so it is a best practice to engage a services firm early to design the network and estimate the costs. With the benefits and costs, you can then build a standard discounted cash flow model and test to see if it exceeds company hurdle rates.

FIGURE 2

Opportunity to Capture Lost Revenue Due to Counterfeiting



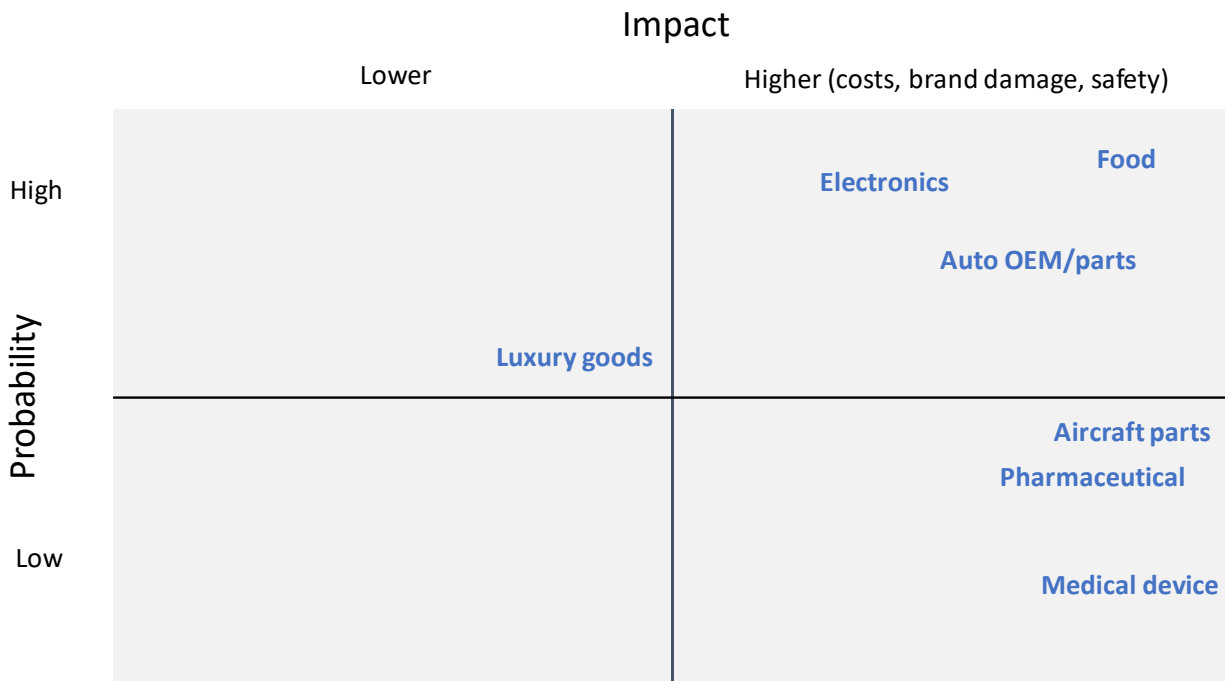
Source: IDC, 2018

Product Quality

Making the financial case for a quality and recall blockchain is different from the anti-counterfeiting one. Recall and quality projects are essentially a risk mitigation effort and should be approached as such. The process involves understanding the probability of an incident and its impact. Multiply the probability and impact of multiple scenarios and use a median value of those scenarios as the financial justification (see Figure 3).

FIGURE 3

Probability and Impact of Product Quality by Industry



Source: IDC, 2018

A calculation of the impact should include all of the elements. First, it should include the cost of remediation: all of the activities involved in recalling and repairing the defective products. Second, it should include an estimate of the damages that would have to be paid to the affected parties and the fines that might be levied by regulatory agencies. Last, for quality business cases, it should include the impact of brand damage, starting with a loss of market share.

The business case should describe how the blockchain network can reduce the probability of an incident and the impact of an incident. For example, better record-keeping will enable more precise identification of defective parts or ingredients, reducing recall costs. If the estimate is a 5% probability of an incident that would have a \$500 million impact (\$25 million), the justification can be made based on cutting the probability in half and the impact by 75%, which would yield a benefit of nearly \$22 million. The cost of implementing the blockchain network as discussed previously becomes the "insurance premium" that mitigates the whole risk of \$500 million, but the financial justification should be built based on \$22 million.

Putting the Two Together

It is very likely that the same blockchain network implementation can satisfy the requirements to improve both eliminating counterfeiting and ensuring product quality. An automotive OEM, for example, must collect information for the same supply chain participants for both anti-counterfeiting and product quality efforts. If both are an issue for your company, plan on building the justification on the combination of the two.

Laying Out the Process

We have discussed the need for including all of the value chain participants in the blockchain, but it is also important to understand that we must also be comprehensive in considering the process. Figure 4 shows a typical end-to-end value chain process. Let's look at this process in the context of a consumer electronics device – a wireless home speaker produced by the famous theoretical brand Best Tech Audio (BTA).

FIGURE 4

End-to-End Value Chain Process



Source: IDC, 2018

It all begins with the initial ingredients, raw materials, and components. Most products start with materials that are processed in batches and come to resemble discrete objects as they move toward the final item. It is important to validate things such as country of origin and certificates of compliance with approved processes (e.g., chemistry, metallurgy, ingredient grade). In food, it is also important that ingredients were grown and processed in a way that is consistent with good health practices and brand promise (e.g., no genetically modified ingredients).

For BTA, this can include the quality of plastic used for the enclosure, the synthetic materials for the speaker cones, and the electronics brains of the crossover circuit board. In the past, BTA would have had to collect records and certificates of compliance from its suppliers and reconcile them to its specifications. With blockchain, the suppliers transact the pedigree information directly into the ledger.

When the products are assembled or packaged, it is important to connect factory records to the product record. These activities will help validate that accepted processes were followed and that situations that could cause an adverse weren't present (e.g., knowing that the product that claims to be peanut allergy free wasn't processed in close proximity to a product that contains peanuts).

For BTA, this may mean the ability to certify that the contract manufacturer was compliant with fair labor practices. The blockchain can also record all of the movements through the process to ensure that the necessary steps and tests were completed. The application could also ensure that any critical components supplied by BTA were used exclusively in BTA products.

It is also important to monitor while the product is on the move and at rest. What were the ambient conditions in the truck or warehouse? Having these records tied to the product genealogy can provide the basis for early warning and for more precise recalls.

BTA could use the blockchain application to track the movement of the finished product from factory to store, ensuring that all proper handling methods were used. The application could also establish an immutable chain of custody and provide proof that no product was diverted into the gray market. Integration with regulatory bodies such as customs can speed the processing of goods at both the outbound and inbound ports. Connecting this blockchain to a trade finance blockchain can eliminate friction in the settlement process.

The process ends with the purchase. The consumer should have assurances that the product is as promised and safe. This step is particularly important in anti-counterfeiting because it provides the mechanism to validate provenance for the buyer.

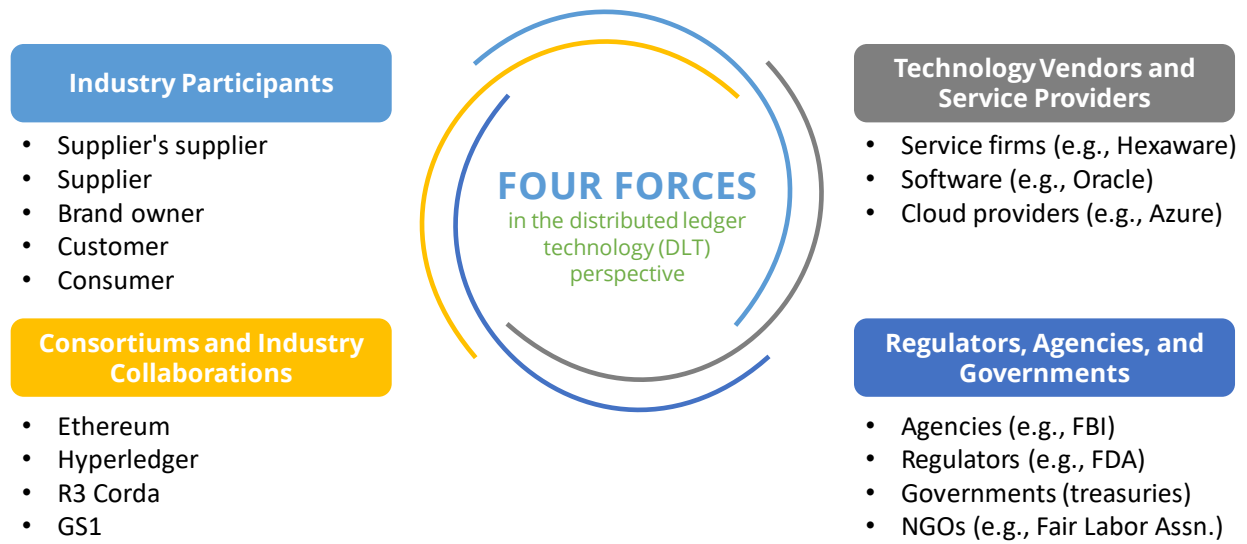
Buyers of the speaker can visit the blockchain application to validate that they are receiving a genuine BTA product. They can also find proof that the product was produced without any labor rights violations and that no conflict minerals were used.

Bringing All the Participants Together

IDC developed the "four forces" model to describe which organizations have to come together to effectively implement a blockchain network. Figure 5 shows how to think about these groups in the context of a KYP initiative.

FIGURE 5

The Four Forces of a KYP Blockchain



Source: IDC, 2018

Regulators should be invited to participate in these blockchains. There are two types of relevant government groups for this type of blockchain: those that provide regulatory oversight (e.g., FDA, FAA, NHTSA) and those involved in law enforcement. Giving these entities access to record-keeping can assist in the interdictions of counterfeit goods and can speed the processing of correction actions such as airworthiness directives in aerospace.

Choosing a platform will be an important part of the implementation. Several platforms are emerging from open source and consortia such as R3 Corda, Ethereum, and Hyperledger. Hyperledger has several pilots related to product traceability and is a good choice, but the company might want to explore industry-specific efforts such as those at GS1 in consumer goods, particularly food.

Industry participants in the blockchain must encompass the whole value chain – the suppliers and the suppliers' suppliers as well as the customer and the customer's customer. Brand owners are often the value chain captain, but make sure you are working with a partner that knows how to recruit and onboard these network nodes.

The technology providers are central to the effort as well. There are a lot of choices between cloud services and distributed ledger applications, so the most important participant in this group is the service provider. In addition to recruiting participants, service providers should also be able to help you sort through the technology options and provide the necessary systems integration.

As discussed previously, it is difficult for a single entity, even the brand owner, to bring these participants together and serve as a central clearinghouse for the record-keeping. Food industry participants have tried to work with organizations such as GS1 in the past with modest success. Having a standard approach for distributed ledgers that are synchronous and immutable facilitates more streamlined participation.

Recommendations

Most companies begin with a proof of concept, partly to deliver business value but also to gain experience with blockchain technology. Product traceability is an excellent candidate because it has the potential to provide a meaningful return and can be driven by a value chain captain, which brings the product brand owner a level of control and an opportunity to gain important experience with the technology. IDC recommends the following steps once the investment has been justified and approved:

- Conduct a design thinking session to visualize how the application will work across the end-to-end value chain.
- Devise a plan and begin to execute on recruiting the key participants in the value chain that are needed to be successful, including government agencies.
- Determine which blockchain platform and cloud provider are the best fit for the project.

Most importantly, choose a service provider that has experience with all of these steps, blockchain competency, and the requisite industry knowledge.

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