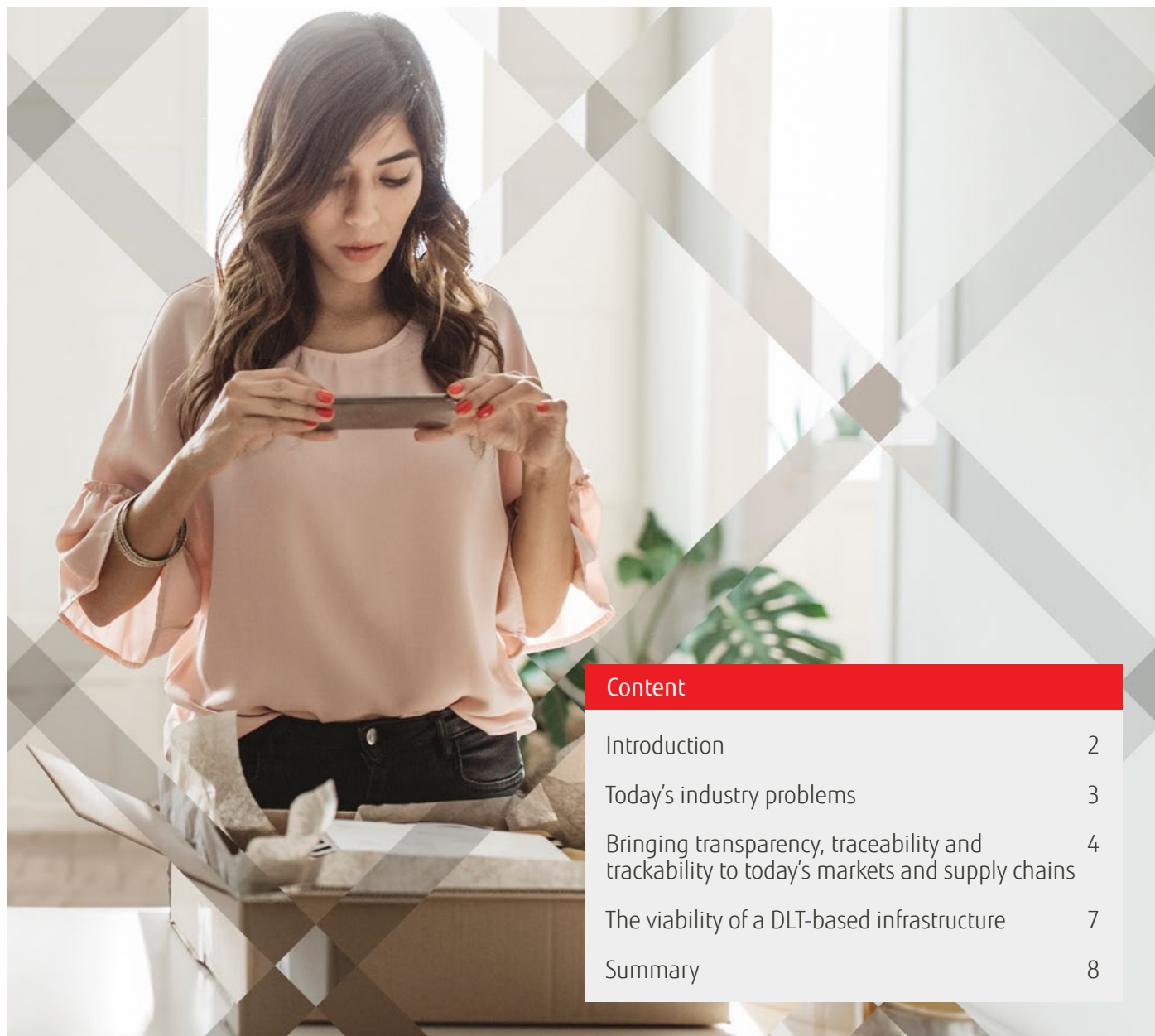


White Paper

Trust and Trace: How to verify authenticity, regulate supply chains, and protect the safety of consumers

Reimagine security, traceability, and finality to your everyday operations with distributed ledger technology



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Introduction

Any products' journey from business idea to end customer is a complex one. Today's global supply chains are typically lengthy and convoluted. Consider the variety of raw material suppliers, manufacturers, distributors, retailers, resellers, and countless additional intermediary parties that are involved. And while visibility and validation across every stage of a supply chain is of course desirable to trace the true origin of inputs – and essential for consumers – the reality is plagued by inefficiencies, friction and expense.

Supply chains are fragmented and under pressure due to evolving and changing economic realities. As such, this presents too many opportunities for inauthentic, substandard, or unethical parts or ingredients to be introduced into manufacturing and other processes, both accidentally or intentionally. Counterfeit products are therefore becoming more ubiquitous and indistinguishable from the genuine articles. It is a problem affecting multiple global industries from food, cosmetics, pharmaceuticals, automotive, and aerospace. Brands, organizations, and end-consumers all continue to feel the impact.

Distributed ledger technology (DLT) brings a trusted point of validation across production, supply, distribution, and sales networks. Crucially, it provides a transparent and tamper-proof way of tracing, tracking, and verifying the credentials of an item throughout its journey and lifespan. A seal of authenticity can be quickly and simply illustrated, as well as mathematically evidenced.

In this paper, we demonstrate why trust and trace solutions are imperative across supply chains. Next to the classic friction and inefficiencies topics we showcase specifically how this can be used to tackle fraud and counterfeit products. We highlight the value of trust and trace and illustrate how distributed ledger technology can enhance and optimize existing business processes by bringing evidence through immutability and finality.





Today's industry problems

The complexity and fragmentation of global supply chains continues to provide the opportunity for counterfeit products to find their way to end consumers. When this occurs, it can put lives at risk and threaten the future of organizations and industries across the globe.

Food fraud

Food fraud or the deliberate adulteration, substitution, tampering, or misrepresentation of food is growing worldwide. It is estimated to cost the global food industry \$49 billion annually in lost sales, reduced margins, and reputational losses by retailers, while also funding criminal enterprise.

Foods that contain banned or unethically produced ingredients can become non-compliant with regulations and illegal in certain markets. While fraudulently labelled food can undermine or destroy company reputations and impact those operating legitimately, the impact on consumers can be catastrophic. When food contains unlisted or impure ingredients, this can potentially result in serious injury or death for allergy sufferers.

As an example, the horsemeat scandal hitting Europe in 2013, illustrated to a global audience the vulnerability and fragility of food supply chains. When horsemeat was first found to have entered the beef supply chain, it caused a ripple effect across Europe. Numerous supply chains were found to have been infiltrated, leading to millions of products being withdrawn. There was a huge loss of consumer confidence in some of the biggest brands across the continent. The impact on the food industry was economically disastrous, affecting consumers, supermarkets, food production companies, and entire economies.

This was not an isolated incident, with the issue of food fraud continuing to persist. Wal-Mart was hit in China in 2014 when having to recall donkey meat products which were found to contain the DNA of other animals. Two years later in the USA, products claiming to be 100% pure parmesan were proven to consist of no cheese at all.

In 2018 in the UK, a range of supermarket dishes said to include cumin seeds as listed ingredients were shown to have fraudulently used peanuts and almonds as a cheaper substitute.¹ This misrepresentation of food can easily endanger life.

The following year, diseased cows slaughtered illegally in Poland entered the food chain of 11 European Union member states.² To this day, product verification across the supply chain also remains a key challenge for the global plant-based and meat-free industries.

Pharmaceutical fakes

The prevalence of fake pharmaceutical products continues to put people in danger, with estimates suggesting as many as one million consumers die every year as a result of counterfeit medicine.³ This includes an estimated 250,000 children.⁴

Falsified drugs have infiltrated the industry to such an extent that around 60% of online search results for pharmaceutical drugs leads to counterfeit products.⁵ Research has also shown that if there is no physical address listed for an online pharmacy, there is a one in two chance that the drugs are fake.

This becomes a key issue for elderly and at risk patients who don't want to travel to brick-and-mortar pharmacies. Regulation of online pharmacies is particularly problematic, with verification a complex and logistically challenging process.

1. <https://www.itv.com/news/2015-02-14/fsa-launches-investigation-after-nut-traces-found-in-spices/>
2. <https://www.bbc.co.uk/news/world-europe-47071234>
3. <https://www.theatlantic.com/sponsored/pfizer-2017/need-to-know-fake-medicine-is-a-bigger-problem-than-you-think/1610/>
4. <https://www.theguardian.com/science/2019/mar/11/fake-drugs-kill-more-than-250000-children-a-year-doctors-warn>
5. <https://www.incoproip.com/reports/how-and-why-search-engines-must-take-responsibility-for-tackling-counterfeiters>

Counterfeit cosmetics

Fake cosmetics likely contain toxic and hazardous materials, with dangerous levels of lead, mercury and cyanide found in counterfeit make-up. The heavy metals have been linked to a range of health problems from allergic reactions and skin sensitivity, to nerve disorders and even death.

And it's an issue that is on the rise. Between 2017 and 2018, more than 2.2 million fake body care items (inclusive of cosmetics and perfumes) were seized in the UK, with more than \$300,000 of counterfeit make-up and beauty products confiscated in downtown Los Angeles in January this year.⁶ In certain instances fake products have even made their way to the shop floor with Estée Lauder launching legal action against Target Australia in 2012 claiming it was selling counterfeit MAC Cosmetics in its stores.

It is a complex, time-consuming, and costly process for organizations, industry bodies and police forces to attempt to keep up with the fraudsters.

While brand owners and brand ambassadors attempt to raise consumer awareness, the burgeoning fake cosmetic industry continues to fund illicit crime across the world including child labor and trafficking.

The question of validation

In many cultures, business transactions are sealed and underpinned by a handshake. This simple gesture forms the basis of trust, between two or more parties, offering a signal of intent and agreement. For products to reach the end consumer exactly as they are claimed to be, trust in these agreements at every stage of the supply chain is essential.

But while those parties were privy to their agreement, there is no way for third parties or consumers to have transparency to see the full extent of the agreement. How can these agreements be validated? Crucially, how can underhand agreements between those looking to introduce fake or substandard goods into the supply chain be captured?

Sophisticated global supply chains have facilitated the rapid rise of complex markets and ecosystems that involve multiple agreements. Where there is a lack of shared data and an overreliance on micro-agreements at every stage, it is too easy for the links of the chain to be broken or corrupted. The fundamental requirement is a need to monitor and track every agreement to develop a "clean" supply chain that promises product quality, safety, and authenticity.



6. <https://www.latimes.com/california/story/2020-01-13/fake-kylie-cosmetics-lip-products-other-counterfeit-makeup-seized-in-l-a-fashion-district>

Bringing transparency, traceability and finality to today's markets and supply chains

Through the application of DLT to global supply chains and complex ecosystems, each handshake is replaced with a digital agreement. The data from each of these agreements is held on the digital ledger and cryptographically connected. Consumers and businesses can access a transparent supply chain.

Increased transparency is the key driver for the adoption of DLT for 75% of organizations.⁷

A distributed ledger ensures that all system users have access to identical data, with new data only added by consensus. Importantly, data cannot be altered, amended, or tampered with.

The technology therefore provides a trusted point of validation, offering a simple solution to track and trace goods across complex supply chains. Any attempt to alter data by a single user will be transparent to all users, thus creating immutability of data.

In the real-world, supporting technology (increasingly IoT) is required to generate the proofs that are then recorded on the distributed ledger. A counterfeiter cannot replicate the required information that is used as the seal of authenticity, preventing fraudulent products from entering the supply chain. Regulation of product quality becomes simple and straightforward.

50% of business leaders are using or are planning to use DLT to enhance data integrity.⁸

And by giving every stakeholder the ability to check the same verifiable data and knowledge in real-time, large efficiencies can be gained. Delays will be reduced and any potential friction between parties will be gone with disputes able to be settled quickly and effectively.

Distributed Ledger Technology Supply Chain Advantages

- Simplicity
- Transparency
- Tamper Proof
- Prevention of fraud and error
- Increased efficiency
- Finality

DLT-based solutions for trust and trace

DLT is a supplementary platform that integrates with existing data capture systems. The distributed ledger enhances any existing business processes by bringing evidence through immutability and finality.

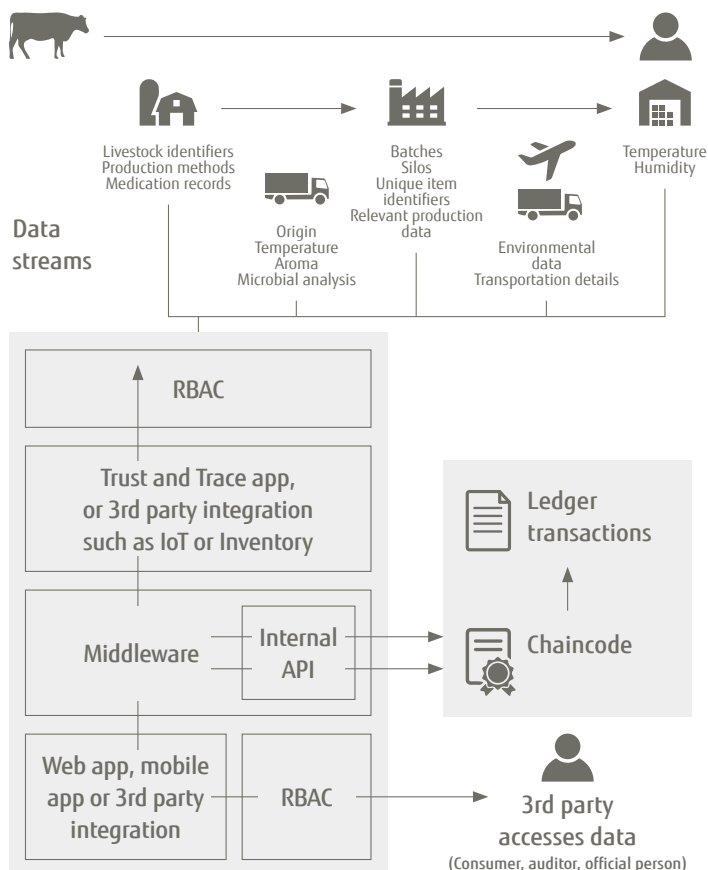
Tracking and tracing products across supply chains is an essential requirement for 30% of DLT-based networks.⁹

Each DLT-based solution must be unique for the challenges of each industry and supply chain. At this stage however, it is important to note the possibilities for a DLT-based infrastructure:

- DLT can be implemented as subscription, pay-as-you-go SaaS on a cloud-based platform
- Authorized third parties access via a mobile app or web app is provided via an API gateway
- By combining with existing analytics, data can be aggregated prior to being stored on the ledger

The below illustrates the potential implementation of a DLT-based infrastructure across an existing supply chain.

This isn't conceptual. It is something that is happening now and is a very real possibility across industries of all scales, from pharmaceuticals, cosmetics, manufacturing, and food.



7. Taking The Pulse of Enterprise Blockchain, a commissioned study conducted by Forrester Consulting on behalf of Fujitsu, May 2020.

8. A commissioned study conducted by Forrester Consulting on behalf of Fujitsu, May 2020.

9. A commissioned study conducted by Forrester Consulting on behalf of Fujitsu, May 2020.

Providing supply chain visibility

DLT is already being used to provide supply chain visibility and to ensure product quality and safety in the global dairy industry.

Fujitsu is currently collaborating with one of the biggest dairy businesses in Europe. With a foothold in the international dairy market, they are continuing to grow further across international markets, with subsidiaries in Russia, Scandinavia, the Baltics, USA, and China.

By implementing a DLT-based infrastructure across the supply chain, every transaction at every stage is recorded and logged on the ledger. This creates a link between the physical and digital world, providing:

- Essential visibility for all parties across every stage of the supply chain, including regulators, stakeholders, and end consumers.
- Verification of food quality and safety for consumers.
- Efficiencies and cost savings in facilitating the audit and compliance process.

Here we are simply focusing on one element of a global trade. With the capabilities of DLT, comes the potential to implement trust and trace across complex global ecosystems in even the oldest and established markets.

“ The more I learnt about the rice market, the more amazed I was at the antiquated way business was conducted. While there are difficulties in connecting with new suppliers and buyers, crucially there are no digitization or automation of trades. ”

Implementing trust and trace across a global ecosystem

Every day across the world millions of metric tons of rice are consumed. As a food staple for millennia, it provides the bulk of daily calories for billions of people globally.

This ancient crop is relied on by millions of small farmers to provide a living for themselves and their families. The global rice industry may be worth \$450 billion annually, but it is a market that's plagued by inefficiencies. Rice trading lacks transparency and is a complex and extremely process-intensive business. At key stages of the supply chain, there is an over-reliance on hardcopy paperwork and scarcity of market data.

“The more I learnt about the rice market, the more amazed I was at the antiquated way business was conducted. While there are difficulties in connecting with new suppliers and buyers, crucially there are no digitization or automation of trades.” Stephen Edkins, CEO, Rice Exchange

Rice Exchange is a private permissioned DLT solution, implemented by Fujitsu, for the trade and commercialization of rice, using automation and distributed ledger technology. It is the first fully-integrated platform for the global market enabling buyers, sellers, and service providers to find each other in a digital form. Trades can be conducted, insurance arranged, with agreements on shipping and settlement underpinned by verifiable data.

Crucially, product quality and provenance can be inspected and verified through immutable data, offering essential transparency and traceability to this complex trade.

While the quality of the final product is guaranteed for consumers, and there is less waste across a more efficient supply chain, the social good of the trade and the position of smaller farmers is also enhanced.

Every negotiation and agreement between parties will be captured as messages on screen and recorded on the ledger, offering both finality and transparency. This is essential for dispute resolution but also to eliminate the ability for substandard products to enter the supply chain. Smaller farmers enjoy greater profits and enhanced security.

The next step for the Rice Exchange platform is to provide the capability to track rice on its journeys across the world. Containers of rice will be tracked on ships and to a last mile accuracy once a container is unloaded at a port and the bags of rice are transported onto a lorry.

An industry once plagued by fraud will operate with new-found transparency, clarity, and finality.

The viability of a DLT-based infrastructure

The viability of a DLT solution centers on the right grounded approach to implementation and the ability to integrate with existing IT systems and legacy infrastructure. Collaboration with the right strategic partner may also be essential.

Just 1 in 10 DLT solutions have been successfully rolled out.¹⁰

Having developed a minimal viable product (MVP), Rice Exchange needed to find a strategic IT partner with DLT experience to take it to a market-ready form. Fujitsu was chosen to build a production-ready, private, permissioned DLT scale-out solution running on Hyperledger Fabric and hosted on Microsoft Azure, with advanced automation features. Experts from the [Fujitsu Blockchain Innovation Center \(BIC\)](#) in Brussels are continuing to collaborate alongside Rice Exchange to develop the solution.

“Working with Fujitsu enabled us to remove the many barriers that have prevented transparent low-risk trading in rice. We now have a seamless, integrated, and robust platform where everyone can see the pertinent data and documents in real-time. It makes every step of the process more efficient and trustworthy.” Stephen Edkins, CEO, Rice Exchange

At its launch in 2019, more than 500 importers and exporters across 60 countries were involved. The initial program included insurers, shipping lines, inspection services, loss adjusters and marine surveyors.

It has created a secure and trusted environment.

“ Working with Fujitsu enabled us to remove the many barriers that have prevented transparent low-risk trading in rice. We now have a seamless, integrated, and robust platform where everyone can see the pertinent data and documents in real-time. It makes every step of the process more efficient and trustworthy. ”

Essential collaboration delivers outcomes-focused solutions

Fujitsu DLT incorporates an outcomes-focused co-creation approach. We evaluate the needs of the organizations within business ecosystems to establish whether there is a need for the technology and if a business case exists, and even provide support to scale to production.

Our agnostic approach begins with the question of how to solve a business need. The unique nature of the ecosystem and supply chain defines the solution and the most appropriate mix of technologies.

We never impose a one-size-fits-all technology platform, leaving key infrastructure choices in your hands. Our co-creation approach is underpinned by our:

Focus on digital transformation solutions

We understand that DLT is not the answer to all business problems. Our decision tree approach identifies the most appropriate action and underpins our commitment to co-creating trusted digital transformation solutions.

Fujitsu’s digital transformation experts offer a grounded approach that focuses on the issues, business needs, and potential outcomes rather than the technology. We ensure that DLT is only identified as a solution if it brings real added value to the supply chain, the organizations within in, and the end consumer.

Rapid and unique methodologies

Our global [Digital Transformation Centers](#) house our teams of talented and experienced experts and facilitate collaborative engagement alongside key business stakeholders to achieve a dynamic mix of knowledge, creativity, ideation, and concept development.

Fujitsu’s unique [Human Centric Experience Design \(HXD\)](#) methodology is a proven and flexible iteration of design thinking and enables concepts to be created at speed. Once Proof of Concept is established, DLT projects can be de-risked and fast-tracked to deliver MVPs with real ROI in days not months.

Global ability to deliver end-to-end solutions

Within our multi-disciplinary team are IT developers, technology specialists, business engineers & analysts, process engineers, scrum masters, enterprise & IT architects, and legal experts. They all come together to provide expertise, unique mindsets, and the right approach to finding the most appropriate technology solution.

By offering an end-to-end suite of modules, platforms, offerings, and services, we enable efficient and quick resolutions to be sought. As a top five global integrator, our specialist knowledge ensures DLT systems are integrated deep within supply chains, driving additional value across global ecosystems.

10. A commissioned study conducted by Forrester Consulting on behalf of Fujitsu, May 2020.

Summary

Across current global markets, organizations, entire industries, and end-consumers suffer due to the fragmented nature of today's supply chains. Counterfeit and substandard goods continue to infiltrate causing regulatory difficulties, a lack of validation, inefficiencies, financial implications, and safety issues.

DLT promises a solution that reimagines transparency, traceability and trackability to even the most complex of global trades. And when implemented in the right way it can enhance supply chains, not only in everyday operations, but benefiting organizations at every level, removing substandard products, and ensuring the safety of end consumers.

[Learn more](#) about Fujitsu's co-creation approach to distributed ledger technology.

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Email: askfujitsu@ts.fujitsu.com
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