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Transformation

Trade Finance Disrupted: A Blockchain Use Case

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Abstract

Blockchain holds considerable promise, but all too often it fails to find sustainable use cases. Trade finance is one significant exception. This traditional revenue source for banks is ready for disruption. A whole new approach, informed by blockchain logic, could bring the very transformation an established yet restricted business is crying out for. Placing the end-to-end trade finance process on a new platform would have a very clear objective: to offer all exporters and importers fast and easy access to credit issuance and advisory services. This is a radical shift but it is within reach. An open, automated, and transparent trade finance platform, which replaces cumbersome trust mechanisms with automatic checks and assurances, is a technical possibility right now. Barring certain technical and legal challenges, a product vision for blockchain as a disruptive force in trade finance is described and validated, awaiting adoption by a consortium of industry players willing to pilot a solution.

INTRODUCTION

Clients of trade finance services have been struggling for years with the risks involved in doing business with partners that are in other countries and whom they might not trust. Traditionally, the settlement risk has been lowered using letter of credits; however, the preparation and execution of these transactions have consumed a considerable amount of resources by the multiple parties involved.

Previous attempts of using technology to address the clients' pain points have not provided the desired breakthrough (we will be highlighting some of them later in this article). Would blockchain just be another technology not addressing the specific trade finance issues, does it have the power to finally disrupt the trade finance business, or may it be just another attempt designed for failure?

This article examines the current structure and state of the trade finance industry and summarizes previous efforts to address the needs of customers. It then introduces blockchain, and the potential of Distributed Ledger Technology (DLT), as a context to a product vision for a blockchain-backed trade finance platform, which we would like to introduce.

We conclude on further feasibilities and challenges or other potential roadblocks that could prevent this product vision from becoming successful, such as the legal challenges currently involved.

PROBLEM STATEMENT

The global trade of physical goods relies on the availability of credit, solid logistics, and transparent payments. Trade finance as a discipline addresses these challenges with well-established instruments to issue credit, document the transfer of exported or imported goods, and execute the subsequent payment. Our clients tell us that this business has become harder to manage than ever before.

Traditionally, the trade finance business has targeted exporters and importers of a certain size, with only mid-range to larger players being able to afford trade finance services. These include issuance of letters of credit (LC) and payment services on the buyer's side, as well as creation of bills of lading on the seller's side. The combination of the two, along with the respective negotiation, shipping, and payment processes, form the foundation of traditional trade finance.

There is room for growth [Clark (2014)]. Most crucially, today's trade finance business suffers from some key challenges:

- **Poor customer experience:** from a bank's point of view, the key customers, exporters, and importers often suffer from a poor end-to-end customer experience. Not only does the issuance of LC-backed trade finance transactions require high coordination efforts among exporters, importers, and issuing and advising banks, often represented by individual legal counsel, the settlement of the transaction follows overly complicated and manual processes, long waiting times with low transparency, and a relatively high residual settlement uncertainty. For example, importers still face the delivery risk of fraudulent shipments, even if the transaction is backed by an LC, and have to proactively and manually track all stages of the agreed delivery terms.
- **Increasing cost pressure:** issuance of LC is associated with high costs for both the bank and clients, while dispute resolution and limited scale create additional pressures due to a relatively high fraction of manual processing and a yet untapped customer base. Trade finance providers can gain strategic advantages if they succeed in finding fundamentally new approaches to delivering the service to their clients.
- **High regulatory burden:** management of geopolitical risks, such as sanctions and trade barriers, along with fraud prevention, KYC (know your customer), and AML (anti-money laundering) requirements are becoming a larger part of the trade finance business, further driving up operational overheads.

Since transactions may be highly complex, global, and expensive, the business is in dire need of both significant reductions in cost, as well as new sources of revenue to provide a broader, more stable footing for the business.

BLOCKCHAIN AND DLT

Overview

In 2008, Satoshi Nakamoto published the whitepaper concept for a new cryptocurrency called bitcoin, aimed to redefine how peer-to-peer transactions could work without clearing intermediaries. While the currency has fallen victim to countless journalistic critiques, the underlying mechanism of recording transactions without spending the same coin twice, namely blockchain, remained pertinent. Tapscott (2016) provides a succinct definition of the blockchain as "a vast, global distributed ledger running on millions of devices and open to anyone,

where anything of value – money, but also titles, deeds, identities, even votes – can be moved, stored and managed securely and privately. Trust is established through mass collaboration and clever code rather than by powerful intermediaries like governments and banks."

Blockchain, or DLT, captured the hearts and minds of the very sector it was set to disrupt. Many existing financial services firms have reacted quickly and innovatively to this potential disruption, appearing to embrace its characteristics by launching joint ventures, creating industry alliances, joining consortia, and implementing proof-of-concept use cases. But will this be enough to combat the effects of disruption?

CHARACTERISTICS AND FEATURES

Characteristics

A blockchain is a permission-less distributed database that maintains a continuously growing list of transactional data records. The system's design means it is hardened against tampering and revision, even by operators of the nodes that store data. The initial and most widely known application of the blockchain technology is the public ledger of transactions for bitcoin, but its structure has been found to be highly effective for other financial vehicles driving disruption in financial services. Some key characteristics of the technology are listed below.

- **Consensus building:** the ability for a significant number of nodes to converge on a single consensus of the most up-to-date version of a large dataset, such as a ledger.
- **Transaction validity:** the ability for any node that creates a transaction to determine whether the transaction is valid, able to take place, and become final (i.e., that there were no conflicting transactions).
- **Automated resolution:** an automated form of resolution that ensures that conflicting transactions (e.g., spend the same balance in different places) never become part of the confirmed dataset.
- **Generic adaptability:** originally applied to currencies, the chain can be applied to record transactions for any kind of assets (or even pure information), registering their existence, ownership, and changes thereof.

Features

While hailed as a new, disruptive technology, it remains important to note that blockchain builds on a range of existing concepts, weaving these into a new paradigm that applies ideas of distributed computing, encryption, and programmable business logic into a singular concept. Among the key features of interest are blockchain's sequential database, distributed nature, immediate processing, smart contracts, immutability, and security.

- **Database:** blockchains can store data in the form of ledger entries that are stored in strict sequence. Every participant in the network can see each other's transactions.
- **Distributed:** many copies of the same data are stored with each participant of the network. This established trust and ownership defined by algorithms and no central party or system is needed.
- **Immediate:** settlement can happen quickly in a large network, and confirmed transactions are broadcast to the rest of the network.
- **Programmability:** smart contracts can store and execute defined business logic while using bespoke "coins" for handling custom assets.
- **Immutability:** a chain of transactions is posted sequentially in time-stamped blocks, so that amendment of a transaction retroactively is not possible unless the blockchain is overridden by the majority of the network or the it is designed to accept changes with a special type of hash that does not endanger the integrity of the overall chain.
- **Security:** the ledger is open to the network, yet encrypted with industry standard private and public keys, where each transaction is encrypted using a hash function depending on the previous transaction or block.

These features lead to the hypothesis that blockchain is a viable candidate to address some of the challenges faced in trade finance. Based on a review of the current market, along with our outlined overall vision for trade finance, this paper intends to confirm the viability and applicability of blockchain as a suitable technology.

PREVIOUS MARKET DEVELOPMENTS

Several efforts to innovate in the area of trade finance and central platform or peer-to-peer network approaches could be observed in recent history.

In the research world, several studies have examined the potential of blockchain and its specific features with regards to solution potential for specific industry issues. From a customer requirements point of view, there is research that underlines that any electronic settlement substitute for manual trade finance settlement must also be able to cope with "trust, risk,

legal recognition and multi-jurisdictional issues" [Dixon and Glasson (2017)]. Likewise, a case study highlighted that the main obstacle to adoption of electronic bills of lading solutions would be the lack of modern, public registries, to which the settlement parties would refer to [Dubovec (2006)].

From a solutions perspective, a study on the potential for blockchain to significantly disrupt supply chains between companies [Dahlberg et al. (2017)] concluded that distributed ledger and smart contract features can contribute to a significant cost reduction and disintermediation in supply chains.

There have also been several developments in the trade finance industry to connect a number of participants in the industry. In 2013, for example, Kyriba, a provider of cloud-based treasury management solutions, announced that it will integrate CGI's Trade 360, a trade finance platform, into its offerings [Kyriba (2013)]. While it is unknown to us the extent to which this effort has addressed actual TF customer needs and what market share this solution has earned, Kyriba's SVP Edi Poloniato pointed out that "the need to manage trade finance and cash management in a single platform has become a core requirement for our clients."

A slightly different approach was announced in the same year by Bolero, a leading provider of electronic trade finance documentation management, who have partnered with China Systems' Eximbills Enterprise to provide a seamless electronic integration of the Eximbills Trade Finance Back-Office solution into the Bolero network [Bolero (2013)]. What might sound like as simply another incremental software evolution, has, in fact, provided an immense automation potential for

banks' back-offices to exchange electronic messages and documents via a platform. We judge this development as a clear sign that trade finance banks, the customers of Bolero, have also expressed that manual settlements of LCs as a clear pain point.

In 2016, Bank of America Merrill Lynch (BAML), HSBC, and the Infocomm Development Authority of Singapore (IDA) tried to bring paper-intensive LC transactions onto blockchain. Even the vibrant community around IBM Hyperledger have begun outlining the use case of an electronic ledger-based LCs [BAML (2016)]. Barclay's claimed to have executed the first letter of credit transaction on a blockchain in late 2016 [Barclay's (2016)]. All these efforts came on the back of a landmark paper released by the European Banking Association on applying crypto technologies to trade finance, which asserts that the potential use cases go beyond LCs and could also serve to enable more flexible financing, better exchange of information, and provide instant payment infrastructures on the back of smart contracts.

We believe that the potential for disruption in trade finance goes beyond simply transactions and could be approached more holistically. According to AT Kearney and the WHU Otto Beisheim School of Management, digitization of supply chains will see significant investment at almost three out of every four firms that trade goods globally [AT Kearney (2015)]. The enablement of a trade finance transaction relies on the end-to-end collection of information through sensors, smart input mechanisms, and real-time data processing. Consequently, we need to determine whether blockchain as a technology can solve the challenges of the trade finance industry, and how it can be used in the context of a broader platform solution.
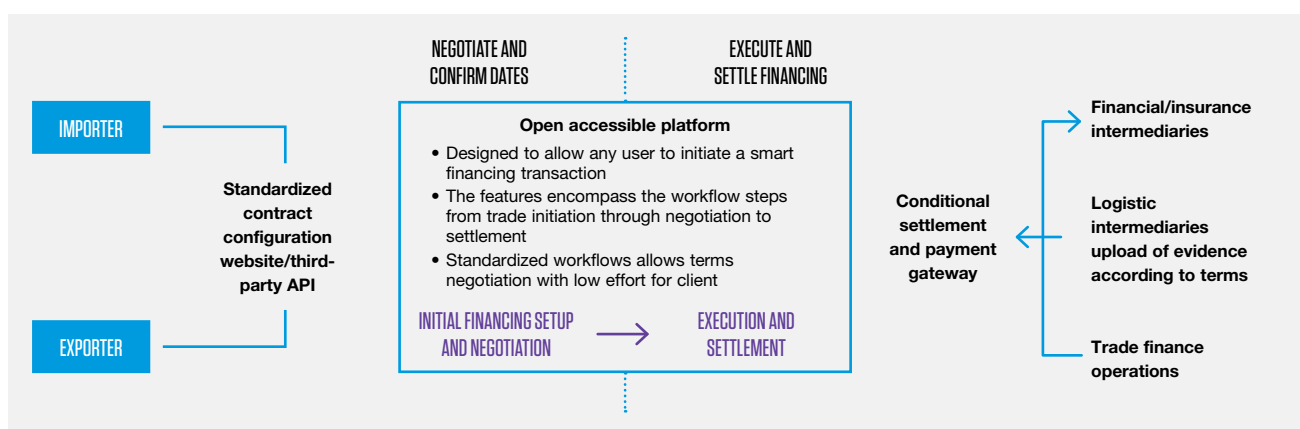

Figure 1

PRODUCT VISION

A potential solution lies in moving beyond trade finance providers' traditional confines and thinking across the wider landscape. Hitherto closed systems need to open up if banks expect to harness untapped market potential that may, sooner or later by virtue of technological developments, be siphoned off by disruptive and niche upstarts. This entails a fundamental paradigm shift: rather than provide a bespoke service to a limited set of clients who can afford it, we envision a marketplace where any exporter or importer can easily and quickly have access to credit issuance or advisory services.

A new platform for executing trade finance transactions is needed. It needs to be open, automated, and so transparent that the parties do not have to rely purely on trust.

- **Trade finance operations teams** need to quickly process transactions and reduce overheads from daily operations to focus on handling a small number disputes.
- **Exporters and importers** need to be able to apply for credit and ensure payment without complicated agreements. They also need to track the status of a transaction at any point in time.
- **Logistics providers** need to understand when goods can be picked up, shipped, and delivered without violating contractual terms of their customers.
- And lastly, the involved **financing intermediaries** need full transparency to minimize risk.

A platform that is open to all involved parties would allow:

- **Self-service "à la carte" contracts:** the platform provides an API for standard contract creation. Exporters and importers can build their contracts through any website that uses the platform's openly available API and use predefined templates or building blocks to ease the creation of contracts.
- **Conditional payment and settlement gateway:** the platform allows for financiers, logistic intermediaries, and bank operations to track and execute the transaction according to the contractual terms. Any software solution can be adapted to use the new gateway.
- Furthermore, such a platform should aim to implement **transparency** of trade finance transactions among the involved parties, in real-time, and,, therefore reduce the **requirement for trust** by minimizing counterparty risk from the outset.

Such a platform would be built by an incumbent or consortium of incumbents, and would scale easily given the openly available APIs to adapt to existing solutions gradually. It could integrate with existing offerings by addressing specific market segments, such as mid-complexity deals, while legacy systems and processes continue to serve the traditional, highly-custom, and personalized LC business. While new market potential can be tapped through this platform, it would also increase competitiveness given the standardized protocol and ease of use, thereby adding pressure to incumbent banks to innovate beyond commodity trade finance services.

So how does blockchain solve any of these challenges? Fundamentally, blockchains are good for a variety of scenarios where a confirmed sequence of events is business critical, and predetermined business logic needs to be respected by multiple nodes in a network with no room for tampering.

Many start-ups have attempted to address trade finance with blockchain. However, we have found them to be lacking in two ways so far. Firstly, they usually aim to map the existing processes into a blockchain, rather than fundamentally rethinking the business model and information flows. This means you will find many solutions providing a "digital LC" but not questioning whether such a letter is needed when credit can be issued, confirmed, and payment initiated instantly. Secondly, they
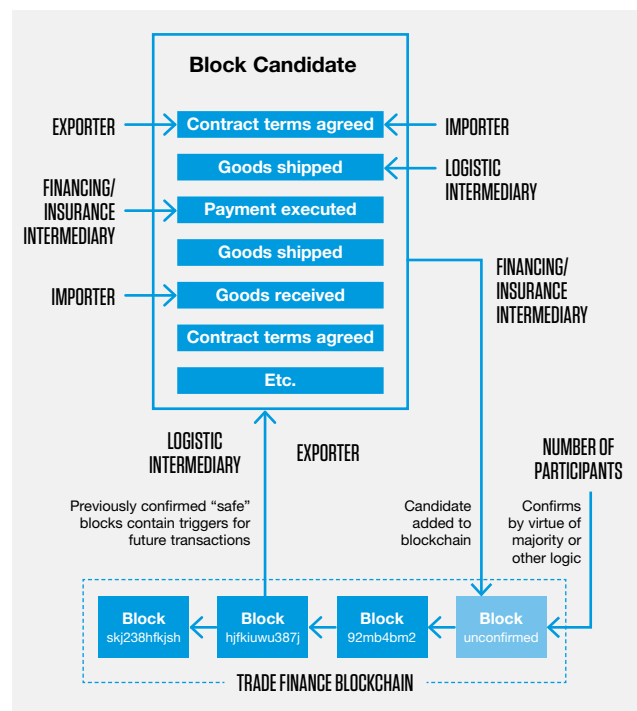

Figure 2 – Sample blockchain-based view

tend to map only a single, isolated piece of the value chain, focused usually on LCs or bills of lading, and much less on the issuance or advisory aspects that go on in-between. Importers and exporters pay for these expensive services but are often neglected and suffer from a poor customer experience.

In the context of a trade finance transaction, we can foresee blockchain solving three fundamental challenges:

- **Automating issuance, shipment tracking support, and payment**: assuming the various network players have adopted the proposed platform, they would record events such as issuance of credit, shipment of goods, or the payment for a transaction in real-time to the blockchain, which in turn broadcasts this out to the network. Given this public record of events, a paper-trail chasing operations team is no longer required and subsequent steps in the workflow can be reliably initiated on an automated basis.
- **Full audit transparency:** shipments are prone to fraud or illegal activity. A shipping container labelled as carrying bananas may be carrying freighting weapons, hence control is needed. Blockchain can support this through a network-controlled mechanism, where a "shared truth" is established by the majority. In addition, all events, such as term agreements, shipments, or payments can be traced back and the likelihood of erroneous events is minimized. Transparency and access to this information can be controlled and limited to approved network participants, resulting in a hybrid blockchain sharing traits of both private and public blockchains.
- **Improved advisory services:** by providing a transparent, up-to-date source of truth, trade finance operations teams are empowered to provide more accurate and relevant advisory services. Moreover, by taking over many of the generic, repeatable, and standardized elements of a transaction, the blockchain frees up resources that can be dedicated to more bespoke forms of advisory.

Beyond these two fundamental aspects, blockchain can enable development of client endpoints across the globe in a cost-effective manner. If the platform champions decide to make development open and the blockchain's logic accessible, rather than just a workflow solution, you would create an entire ecosystem of trade finance apps, all backed by the same internal logic but tailored to the needs of a shipping coordinator, a bank employee, or a buyer of goods.

FEASIBILITY AND CHALLENGES

We acknowledge that a blockchain does not inherently replace your trade finance workflow, however, a platform backed by blockchain, along with other emerging principles of open architecture, collaborative and API-based computing, and real-time processing can provide the foundation for a potentially disruptive solution in this business. This solution, in contrast to previous attempts, would focus predominantly on the needs of trade finance customers, and would fundamentally challenge the banks' man-in-the-middle approach implemented within the existing LC approach.

Putting this into practice will not be simple though. Our proposed vision assumes that a group of partners in the supply chain get on board initially with such a platform, and that adoption is made easy and cost-effective across the entire value chain. The platform comes to fruition by starting with a minimum viable product, such as a smart contract to replace an LC, and building this out to support both incumbent legacy systems as well as newly crafted applications.

Realistically, a transitional model would include smaller chains built by groups and consortia of trade finance parties, which in turn can be chained together down the road with an emerging technology called Sidechains. These allow moving transactions between blockchains if they agree to and adopt some common understanding of proof of work. Trade finance customers may be incentivized to use the new model through lower transaction costs.

Tokenization and ownership
A fundamental technical challenge to multi-party blockchains is posed by process ownership. Who is entitled to write to the blockchain in a series of logical events? How does the blockchain pass the torch from importer to exporter to issuing bank?

In basic terms, blockchains can handle the ownership of assets in the form of coins, as used in any cryptocurrency. Consequently, a paradigm in which the ownership of an ongoing trade finance transaction is handled as currency may be the solution. As "trade finance coins," the handling of process ownership and entitlements to the blockchain can be ensured by executing a transfer of an authorization token, in the form of a coin, to the next party that needs to act in the process. For example, once an importer has received the goods, an authorization token is passed on to the importer's bank, executing the payment to the exporter. In this step, it is ensured that the importer's bank is notified and authorized only once the goods

have been confirmed as delivered by the importer, purely using the mechanics of a blockchain.

Gatekeeping and KYC concerns

A further consideration needs to be made with regards to how new actors can be admitted to and execute trade finance transactions on the proposed platform. In an initial model, we foresee an authorizing entity, such as a bank or consortium of trade actors, approving new importers, exporters, logistics intermediaries, and banks via traditional forms of KYC. Over time, these players will have established histories on the blockchain, facilitating automated KYC procedures for actors to cross-check each other using the available history of transactions on the chain.

Apart from issuing authorizations, safely revoking the same without endangering the integrity of the blockchain is a feature that established blockchain technologies, such as Hyperledger, have yet to implement.

Legal challenges

In order to fully exploit the potential of the blockchain technology, the legal and regulatory framework requires modifications, too. The blockchain questions fundamental assumptions underpinning most regulations, such as the idea that a certain individual or entity is accountable and responsible for a certain part of a multilateral system. In a fully-fledged, distributed blockchain system, neither the infrastructure nor the application itself is centrally operated or controlled, and the lack of central control or gatekeeper is a substantive part of the idea.

With regards to trade finance platform solutions discussed herein, there are various legal and regulatory issues that have to be kept in mind. As the platform would ultimately also affect payments of the parties involved, the provider of such a platform is likely to be held as a provider of payment services by the German Payment Institution Act (Zahlungsdiensteaufsichtsgesetz – ZAG) or similar mandatory provisions of law under legal regimes of other jurisdictions. If the platform solutions also contains the conveyance of insurance products (i.e., such as import/export credit insurance products), the relevant provisions of the German Trade Regulation Act (Gewerbeordnung – GewO) or similar mandatory provisions of law under legal regimes of other jurisdictions will have to be checked in more detail. In case it is intended to offer even further financial services, the German Banking Act (Gesetz über das Kreditwesen – KWG) or similar mandatory provisions of law under legal regimes of other jurisdictions will have to be examined as well, as there is a catalogue of regulated activities that require a

license. Hence, when setting up the solutions discussed herein, it will be crucial to determine beforehand the exact scope of services provided and to assess if and to what extent regulated activities shall be carried out. If regulated activities, such as payment services, are to be provided, either the relevant regulatory permissions need to be obtained by the providing entity or cooperation with partners holding the required licenses, and willing to provide the discussed services in the jurisdictions relevant for the market, could be a solution. As a first step, it, of course, might also be an option to limit the functionality of the platform to a mere technical infrastructure portal and hence avoid any provision of regulated services.

The described trade finance platform could provide for contractual solutions based on "smart contracts," which is based on the idea that a contract is self-performing. In general, this conflicts with the general legal assumptions that each and every legally relevant act must be initiated by a human being. It is easy to imagine smart contracts with autonomous decision-making, and without any human involvement at all. We have as yet no answer to the question of what such a decision might mean in legal terms – and we certainly would need to define rules to determine which decisions may be made by machines, and which require human intervention.

Further, issues could arise once there is a dispute between the parties of such a trade finance platform. There are also no rules regarding the question of how to use blockchain data in court. From a coder's perspective, it is rather clear how a set of blockchain data must be interpreted – but a judge is not a coder, and for now courts rely on expert opinions to establish technical facts. In order to also preserve the efficiency gains of the blockchain in court proceedings, we would need rules and technical solutions that make blockchain data accessible and comprehensible for a court. And the rules should be such that there would not be a need to appoint an IT expert witness in each and every case, which usually results in significant delays before a decision is rendered.

Further questions are raised regarding the enforcement of claims. So far, if a claimant is awarded a title against a debtor, they could enforce it by several means, including seizing payments on the debtor's bank accounts. In a blockchain-based system, any payment would require the active involvement of the debtor, as no third party would be technically able to prompt a payment from the debtor´s crypto-currency account without knowing the private key.

Another feature of the blockchain that challenges traditional thinking is the built-in transparency of a blockchain-based

system. While this is great in some aspects – you always have a bullet-proof audit trail – it raises numerous questions related to data protection regulation and the secrecy of transactions.

A blockchain-backed trade finance platform would, of course, concern the storage and processing of data on a large scale. Even if the trade data are encrypted, it is most likely that at least a significant part of this data has to be qualified as personal data according to the general data protection regulation (GDPR), which comes into force on May 25th, 2018.

Against this background, a blockchain-based trading system would have to comply with the requirements of this regulation, which will be binding and directly applicable in all E.U. member states. For any blockchain platform project, it is, therefore, key to anticipate, who will act as a "controller" according to the GDPR, as the controller is responsible and liable for the lawful processing of personal data. Unlike a public and permissionless blockchain, such as those used for cryptocurrencies, such as bitcoin, a blockchain-backed trade finance platform is likely to be a private and permissioned blockchain, where key functions are operated by one or more entities, who set up the terms of use. It is most likely that those players will have to qualify as "controllers" (or "joint controllers," who are explicitly mentioned in the regulation) from the perspective of GDPR. The controller is obliged to implement appropriate technical and organizational measures to ensure and to be able to demonstrate that processing is performed in accordance with the GDPR. While even a private blockchain platform is basically ideally suited to protect personal information by its decentralized structure, the controller of the platform would have to document how the individual platform protects personal data and information of their users. The GDPR requires the controller to maintain a record of processing activities, which contains amongst other information the purpose of the processing of personal data and descriptions of categories of data subjects.

In addition, under the GDPR controllers will see their obligation to inform the data subject increased. They will have to notify those concerned of the anticipated retention period as well as about the right to withdraw the users consent and the right to lodge a complaint.

An appropriate and compliant privacy policy will, therefore, play an important role for a blockchain-based trading system. Given the fact that the GDPR can lead to significantly higher fines than the current legislation, compliance plays a very crucial role here and the impact of processing personal data on the trading platform should be considered in due time.

CONCLUSION

Trade finance is ready for a blockchain-driven disruption. The technology provides fundamental aids in alleviating concerns around cost, security, ease of use, and speed. Furthermore, a platform surrounding a trade finance blockchain would facilitate actors in executing transactions. Such a platform could be developed as a pilot among a selected consortium of trade actors.

While there remain technical and legal challenges to bring the proposed platform to fruition, a practical business case is likely. We foresee blockchain making large strides in trade finance, as is already happening with distinct pieces of the entire transaction chain. The fundamental question, therefore, is not whether trade finance will be disrupted, but by whom, and when the first successful end-to-end attempt will be made.

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