Exploring Blockchain for Trade Finance Workflows

Permissioned and Permissionless Networks

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Abstract

Trade finance is a fertile ground for tech innovation due to its old practices which are hard to get rid of and the consequent untapped potential which could be exploited by adopting new technologies, including blockchain.

The economic development could be facilitated with a higher adoption rate of certain trade finance products, particularly among SMEs and mid-market companies. The ABD (Asian Development Bank) estimates the global gap in trade finance at $1.5 trillion.

With this paper, we will explore further the distinction between permissioned and permissionless blockchains, outline the advantages of each network type and draw some conclusions on why it might be worth considering the second one. Moreover, we will discuss in detail the potential of locking scripts and how they could be used for settling transactions with Bitcoin now that it's legal tender.

Trade Finance

Trade finance represents the financial instruments and products that are used by companies to facilitate international trade and commerce. Its function consists in introducing a third party to remove the payment and the supply risk, providing the exporter with accelerated receivables and the importer with extended credit. According to the World Trade Organization (WTO), “some 80 to 90 per cent of world trade relies on trade finance (trade credit and insurance/guarantees), mostly of a short-term nature”.

This sector is characterized by multiple stakeholders who have to transfer large amounts of data, often through physical paperwork. The different parties involved include *multiple banks*, *importers and exporters*, *shippers and freight forwarders*, *insurers*, *document carriers* and *customs agents*.

International trades feature several complications due to the information challenges and asymmetric information, as well the different regulatory regimes under distinct jurisdictions.
Furthermore, international exchanges are slow and inefficient due to the heavy reliance on documentation, which is needed because of the high levels of fraud and the risk of money laundering. Many consider blockchain and DLT (distributed ledger technology) as the next step in the sector’s evolution to solve the issues of trust, reduce costs and drive efficiency

Attributes of trade finance

- Multiple stakeholders
- Transferring a lot of data, often through physical paperwork
- Different regulatory regimes and issues of trust
- Information challenges and asymmetric information
- Small to medium size corporations are more credit constrained
- Risk of money laundering and fraud schemes (e.g. double financing)
- Human intervention is needed to handle complications (e.g. problems with the carriers)

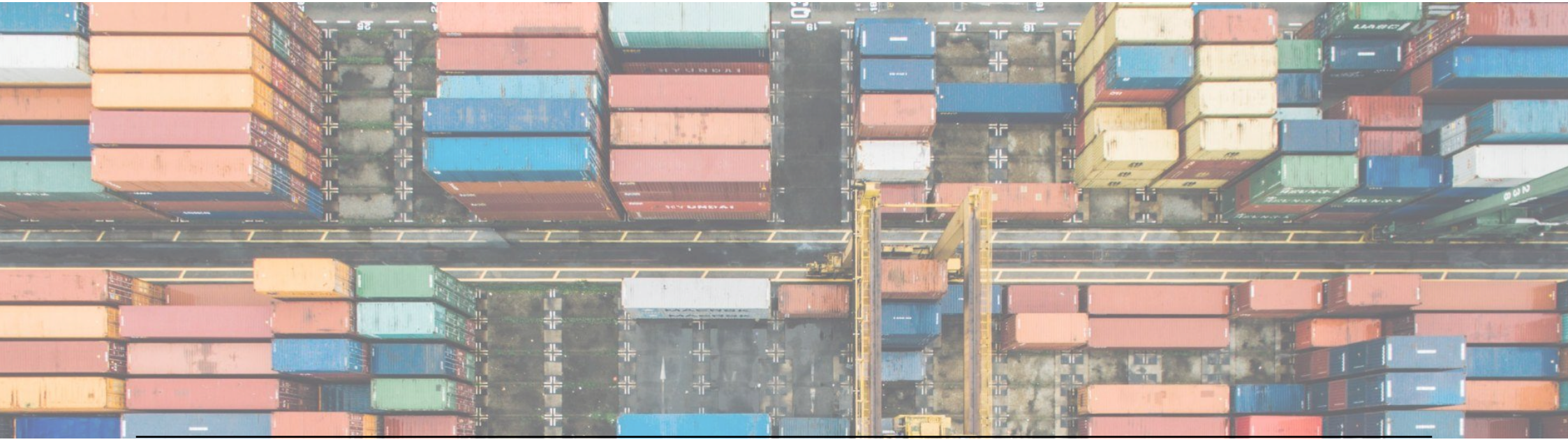
Methods used in trade finance

There are 4 main methods used in trade finance:

- **Advance payment** - the buyer arranges for their bank to pay the supplier around 30% of the order value upfront when ordering, and the other 70% when the goods are released or shipped.
- **Letter of credit (L/C)** - a document that gives the seller two guarantees that the payment will be made by the buyer, one from the seller's and another from the buyer's bank.
- **Documentary collections (D/C)** - a seller instructs his bank to forward documents related to the exporting of goods or services to the buyer's bank, then requesting to present these documents to the buyer for their payment. The contract will also include the conditions under which the documents can be released to the buyer.
- **Open account** - a sale where the goods are shipped and delivered before payment is due, which is typically in 30, 60 or 90 days. Used by business partners who trust each other, advantageous to the importer in terms of cash flow and cost, but risky for the exporter.

It is now estimated that over 80% of global trade finance is conducted on an open account basis. Open account transactions can be described as “buy now, pay later” and are more like regular payments for a continuing flow of goods rather than specific transactions. This extension of payment terms is becoming progressively more common, as it is much cheaper for the corporates and offers mutual benefits.

In response to this development, the organization SWIFT launched the TSU (trade services utility), a collaborative centralized data matching utility, which allows banks to build products around its core functionality to improve the speed and flow of open account trade. This is helping banks re-intermediate themselves into these trade flows.



Current situation

As pointed out previously, one of the critical problems in trade finance is the sheer volume of paper-based documents on which the information flow is based. Many forms of trade finance such as letters of credit still rely on semi-automated and antiquated processes that are based around the physicality of the written word. Besides, these paper-based documents are prone to fraud because of the number of parties involved and the complexity of trade finance transactions.

BCG estimates that the full digitization of trade finance processes would enable the streamline of over 90% of data field interactions, creating a process that is not only faster but also less vulnerable to error and fraud.

Yet today, there is not one platform where all these parties can connect. Instead, they need to connect to a multitude of platforms to initiate business, share documents and communicate.

The gap in provision

The low adoption rates of certain trade finance products, particularly among SMEs and mid-market companies, reduce growth perspective and hinder economic development.

In a report by the Asian Development Bank (ADB) published in September 2019, the global gap in trade finance - the amount of trade finance requested by importers and exporters but rejected - is estimated at $1.5 trillion. This is a major barrier to global trade and economic growth, which especially affects developing countries, mid-market firms and SMEs.

Globally, over half of trade finance requests by SMEs are rejected, against just 7 per cent of multinational companies. According to the WTO, a new effort to support SMEs' access to trade finance could have a very significant, positive impact.

SMEs in developing countries face even greater challenges in accessing trade finance. The estimated value of unmet demand for trade finance in Africa is US$ 120 billion (one-third of the continent's trade finance market) and US$ 700 billion in developing Asia. Bridging these gaps in provision would unlock the trading potential of many thousands of individuals and small businesses around the world.

Without adequate trade finance, opportunities for growth and development are missed as businesses are deprived of the fuel they need to trade and expand.

With so many businesses deprived of the support that they need to grow, as highlighted in the UN's Financing for Development agenda, action is needed to address these trade financing gaps. Digitalization is expected to play a big role in the resolution of this issue.

Next-generation Trade Finance

More recently, service providers, financial institutions, and their corporate clients are seeking to streamline processes, reduce transaction time and cost, as well as mitigating fraud risk by replacing paper with digital data flows and leveraging various technologies.

As trade becomes increasingly digitized, it opens the door to new players and could render traditional trade finance providers obsolete. According to JP Morgan, digitizing trade finance is the next logical step and banks and companies must adapt to this new environment to remain competitive.

However, the shift to digital has been very slow. The reason is evident: trade finance transactions involve multiple parties, all located in various jurisdictions, which makes it challenging to find solutions that work for all of them.

Technologies such as blockchain can streamline the trade finance process and increase the speed and adoption of digitizing trade finance. With blockchain, trade participants can create a digital ledger of transactions that is distributed among a digital network. Using distributed ledger technology and blockchain for trade finance is certainly a game-changer, and with this paper we will analyse their pros and cons.

A distributed ledger is a database that exists among multiple users or across several locations. It is thus "distributed" - each user has a copy of the database - as opposed to a single, "centralized" database to which many users connect.

On the other hand, privacy and trade secrets must be preserved: even just the number of interactions with a smart contract could be a proxy for the economic activity of a company, the future tools need to take into account the competitive nature of trades and protect confidential information.

Moreover, the single source of truth is an appealing property that blockchains can offer, and its key aspect is the proof that different parties received the same non-manipulated data.

According to the 2020 Global Trade Survey from the International Chamber of Commerce, trade and trade finance are in a state of global uncertainty, in part due to

COVID-19. While many banks surveyed expressed concern over pandemic-related declines in trade flows and revenues, the survey also found that lockdowns and working from home are hastening the shift to digital solutions in trade, including blockchain.

Blockchain adoption

The business case for adopting blockchain in documentary trade is clear-cut: increasing trade efficiency, mitigating risk, and expanding trade to smaller companies and regions with less robust trade mechanisms. However, past efforts to introduce transformative digital technologies didn't succeed because they produced narrow and uncoordinated solutions that benefit only a small number of participants.

According to Bain, to realize the potential of blockchain platforms, developers and participants should avoid the fragmentation that limits benefits for the trade ecosystem and thus prevents widespread adoption. It will require collaboration and significant investment from all the ecosystem participants - including trading companies, logistics and shipping firms, banks and customs authorities - as well as trusted parties that will serve as a bridge among networks and play the role of "super connectors".

Although having a single global network might be ideal in the evolution of blockchain for trade finance, it will probably not occur anytime soon. The more likely outcome is a network of networks.

Blockchain-based Trade Finance

Early experiments

Blockchain represents an opportunity to streamline and simplify the complex world of trade finance, saving importers, exporters, and their financiers billions of dollars every year. This technology has received a lot of attention over the last decade, and this resulted in a number of experiments that testify to its potential.

Trade finance blockchain consortia

Standard Chartered and HSBC are 2 banks that have joined consortia dedicated to using blockchain technology to fix trade finance.

One of those consortia is Voltron, run by R3 and CryptoBLK, which operates a blockchain platform for digitizing paper letters of credit.

In October 2020, DBS and Standard Chartered said that they were working on a blockchain-based trade finance platform called Trade Finance Registry. The platform is intended to help detect fraud and duplicate financing for a single transaction in real-time. The 2 banks have launched this project in partnership with 12 other banks, including ABN Amro, Deutsche Bank, ICICI Bank, and Lloyds.

Fintech

Fintech, (non-bank) institutions that use digitized technologies to provide financial services, have become important new players in the fast-changing trade finance market. They focus on cost-reduction initiatives such as automation, and concentrate on mid-tier and non-listed companies, while large financial institutions in this market provide service to established customers and large multinational companies.

For example, Israel-based Wave has developed platforms that enable finance groups to provide letter credit transactions as a blockchain solution in September 2016.

With Wave's platform, EuroFinance in Barcelona was able to provide a blockchain solution to Ornua and Seychelles Trading Company to streamline their supply chain, reduce transaction costs and documentation errors, and quickly transfer documents to customers around the world.

In this instance, the trade process for almost $100,000 of cheese and butter, from the issuing of the letter of credit to the approval of it, took less than 4 hours, drastically down from the traditional time of 7-10 days.

Digitized letter of credit

Cargill's soybean shipment in May 2018 was the first live end-to-end trade finance transaction on a scalable application for a fully digitized letter of credit, using blockchain. HSBC Singapore acted as the issuing bank for Cargill Singapore, and ING Geneva acted as the nominated bank for Cargill Switzerland.

Remarkably, documentation exchange and checking time took place in less than 24 hours, compared with the typical period of 5 to 10 days for a conventional, paper-based process.

"We took a highly manual, complex transaction and made it more secure and efficient," said Rani Misra, regional treasurer at Cargill. "We see the exciting potential of extending this technology into other areas of our financial ecosystem."

Fonterra and HSBC

Fonterra, one of the world's leading dairy processors, completed its first blockchain trade transaction in 2020 by using Wave's platform for an electronic bill of lading (eBL) and other documents in order for HSBC to issue a Letter of Credit (LC).

The regular paperwork process presents multiple opportunities for fraud, while blockchain and paperless documentation diminish the chance of misconduct and speed up the process.
Fonterra registers thousands of LCs per year, and it expects digitizing trade documents to reduce costs, the risk of human errors, document loss, forgery and delays.

Permissioned blockchain

According to Gary Gensler, chairman of the SEC, trade finance is one of the best use cases for permissioned blockchain. The intrinsic configuration of such blockchains controls the participants' transactions and defines their roles, in which each participant can access and contribute to the blockchain.

Permissioned blockchains provide an additional level of security over typical blockchain systems like Bitcoin, as they require an access control layer. A developer building a permissioned blockchain may opt to make a few select records, like product name and quantity involved in a transaction, available for everyone to read.

However, only selected participants are allowed to view the transaction price and other confidential information. Other implementations may include limiting participants to act as nodes on the network, which enhances the network's security. All such permissions and profile maintenance are handled by this access-control layer.

These blockchains are favoured by individuals who require security, identity, and role definition within the blockchain.

Permissionless blockchain

The most important features of blockchain technologies are their demonstrable resistance to changes in historic data and their auditability, the ability of an auditor to get accurate results when they examine a company’s financial reports. In fact, all other features like automation and shared data sources can be achieved in many other ways.

Permissioned blockchains are a compromise solution, where the true state and immutability of the data can be only proven within a consortium. For instance, the members of the consortium could collude or simply decide to switch off the nodes, destroying backups and removing all the stored data.

Hence, it is interesting to explore permissionless blockchains as tools to prove strong auditability. Due to their public nature, however, they cannot be naively used to store data but should only be used to store compacted and encrypted trails of the processes happening on off-chain systems.

Bitcoin has features to provide full confidentiality, auditability and payment locking/unlocking. The main advantages consist in the efficiency with which it would allow to verify the existence of collaterals - so that the

payments can be unlocked as the requirements are met - and their transparency, which makes it easier to inspect funds by verifying the record of their transactions.

To implement these technologies, banks and clients can either join open source consortia like Eonpass, build their own new architecture or leverage existing systems: these approaches allow for the business logic to be implemented in languages and methods widely known and available. This could be more efficient than trying to implement smart contracts, as firms would have to invest more resources to get accustomed to a new way of doing things.

Technical explanation

To better understand how this could work, let's consider a simple scenario: an exporter needs a line of credit to send the goods to an importer, which doesn't want to pay before receiving the products. A bank steps in between receiving the credit from the importer, checking the exporter history and the state of the shipment.

When the required documentation is provided, the bank unlocks all or part of the credit to the exporter. The key aspect is that the exporter should be able to spend as soon as the bank acknowledges that everything is in order.

In Bitcoin, transactions have a locking script that checks that the receiver of a transaction can sign a hashed public key with the matching private key (i.e. that the receiver is indeed the owner of the bitcoin address where the funds are sent).

However, locking scripts can be more complex than this, as they can use basic logic operators and hashing functions. A simple typical locking script can be: display the proof of ownership of an address AND display the knowledge of a passphrase that, once hashed, corresponds to a value in the script.

To unlock the payment, the exporter needs a password sent to him by the bank that can be for example the hash of a signed document. Although bitcoin script language is not Turing complete for various reasons, in the context of Trade Finance the above function is enough to achieve our goal.

The presence of the intermediary in Trade Finance is there to alleviate the natural mistrust in trading that entities who don't know each other have. Having the intermediary entirely removed poses a series of challenges typical of AI models, such as:

- How to update them when malicious attackers identify patterns to "trick" the automation?

- Who's responsible for verifying that the operations are executed in accordance with all the involved jurisdictions? What if the automation doesn't comply with one country's rules?
- Experts in the field still consider human intervention as needed to handle complications such as problems with the carriers and issues unpredictable a priori, will this problem be overcome?

Although automation in trade finance still has a lot of room for improvement, it can clearly drive efficiency and should be explored further. However, some operations will most likely still require manual approvals, and the new systems should take it into account.

Locking scripts' potential

Locking scripts (also known as unlocking scripts) offer the minimum viable functions to:

- Show that the importer has the capital both for the bank and the exporter, and that he's willing to lock the amount.
- Giving the bank the last decision in terms of when and how much of the capital is unlocked in favour of the exporter: the required capital might change during operations due to several variables that have to be taken into account such as (1) currency fluctuations, (2) introduction of new taxes and (3) new information.
- Hiding the participants and the locking scripts inside Taproot scripts: the transaction, after November 2021 and Taproot activation, will look like any other transaction on the Bitcoin network. Currently, locking script transactions are distinguishable from the others in the network, and they can sometimes be tracked to give a proxy of the economic activities of the parties involved.
- Retaining full auditability and proof that the data has not been tampered with.

The data structure describing the shipment can be handled with privacy and efficacy off-chain, and only hashed and signed versions of the documents ever reach the public blockchain.

The last important piece of the puzzle is the legal tender validity of Bitcoin: either importers and exporters agree with a specific contract saying that Bitcoin settles their credit/debit or the parties involved in the transaction need to operate under a jurisdiction where bitcoin is accepted as legal tender. El Salvador became the world's first country to adopt it as such, enacting legislation that took effect on the 7th of September.

Bitcoin Law in El Salvador

At a conference for bitcoin in Miami in June 2021, President Nayib Bukele of El Salvador announced that he would be looking to promulgate a law allowing bitcoin

as legal tender, saying that it would "generate jobs and help provide financial inclusion to thousands outside the formal economy".

With 62 out of 84 possible votes, lawmakers voted in favour of the move to create a law to adopt bitcoin, despite concern about the potential impact on El Salvador's program with the International Monetary Fund. Effective from September 2021, the law requires businesses to accept bitcoin as a form of payment.

According to Bukele, the law is aimed at approximately 70% of Salvadorans without bank accounts and will increase inclusion for them. The president argued that the bill would increase investment as well as reducing fees from current services for remittances.

El Salvador's economy relies heavily on remittances, or money sent home from abroad, which make up around 20% of the country's gross domestic product (GDP). More than two million Salvadoreans live outside the country, but they continue to keep close ties to their place of birth, sending back more than $4bn (£2.8bn) each year.

Though Adrian and Weeks-Brown on the IMF blog did not specifically call out El Salvador, they wrote that making any cryptocurrency a national currency “is an inadvisable shortcut” to more inclusive financial services.

On the first day of bitcoin’s adoption in El Salvador, its price dropped by 17%, highlighting the unpredictable volatility of bitcoin that is one of the main concerns about its transactional usability. However, banks could offer hedging services to get around this problem by limiting the impact of uncertainty. Finally in the latest day volatility is going in favor of El Salvador holdings.

Conclusion

The status of Bitcoin as a legal tender drives us to explore how public and permissionless blockchain can be used in trade finance. So far, permissioned approaches have been investigated and promoted mostly due to their resemblance with “classic” IT systems where access control is easily defined.

The success of all the major experiments so far has been limited by the fact that they were controlled by a known brand instead of creating a proper open-source system, which inevitably hinders adoption. For instance, for fear of sharing clients with competitors.

Deciding whether people need permission to be on the blockchain network is a crucial decision in deploying distributed ledger technologies. While both permissionless and permissioned blockchain architectures enable similar value propositions, their differences make each one more suitable for certain uses and less for others.

The feature of permissioned blockchain of being adjustable to any data sharing requirement is not necessary in trade finance as there are procedures already in place to do so which could be compatible with permissionless systems. Moreover, the one novel proposition of blockchains is that they make available mathematical proofs of which data was shared with whom, and this can be obtained at an even higher degree of certainty with public networks.

On the other hand, as they replicate the concept of existing systems and address the “who sees the data” issue by sharing them between authorized parties, permissioned systems were the logical starting point to investigate blockchains potentials.