ABE EBA

EURO BANKING ASSOCIATION

Applying cryptotechnologies to Trade Finance

Information Paper

EBA Working Group on Electronic Alternative Payments

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1. EXECUTIVE SUMMARY

Cryptotechnologies have the potential to transform the trade finance industry. As technology has evolved and the popularity of open account trading has expanded (making up about 90% of global trade today), banks and corporates require solutions that will enable them to overcome the pain points found in trade finance today. The use of cryptotechnologies (also referred to as distributed ledgers or blockchain) has been explored in areas such as payments and securities settlement, and these technologies could also be used to improve service in trade transactions. While distributed ledgers could radically transform trade finance in the long term, it is likely that the adoption of cryptotechnologies will proceed gradually around specific use cases. The EBA's cryptotechnologies working group has identified two such use cases for the use of cryptotechnologies in trade finance: the exchange of trade data and financing.

The exchange of trade data serves as the backbone for the trade finance workflow, making it an ideal starting point for the use of cryptotechnologies. The approval and matching of data found in trade documents such as invoices can be a trigger for events that follow such as the transfer of ownership or execution of a payment. By facilitating easy access to data and end-to-end transparency of the entire value chain, cryptotechnologies can create a level playing field for all parties involved in a trade transaction and facilitate improved exchange of trade information. The exchange of trade data and auditability of a participant's credit history can also help increase speed, efficiency, and security in financing between buyers, sellers, and their banks. The real-time visibility of events along a supply chain means that financing triggers can be identified sooner, which means that funds can be released faster. Cryptotechnologies can also help improve credit ratings and risk assessment procedures, which can help ensure security for banks and could lead to improved financing terms for buyers and sellers.

The adoption of cryptotechnologies in trade finance still faces a number of challenges, including an unclear legal and regulatory environment, the need to ensure the confidentiality of data and the need to provide the stability of the technology, and the challenge of creating a network effect to spur adoption of distributed ledgers in the trade finance space. But if industry stakeholders work together to meet these challenges, they stand to realise tangible benefits. Distributed ledgers can ensure full transparency of the value chain, reduced error rates and credit risk, lower costs, improve convenience, and provide a level playing field for all participants. This in turn can help corporates improve liquidity and working capital, upgrade the reconciliation process, and provide additional financing opportunities, while allowing banks to meet customer expectations, modernize IT systems, enable the development of new products, and avoid disintermediation.

2. INTRODUCTION

Over the past few years, the finance world has turned its attention to cryptotechnologies, sometimes referred to as distributed ledger or blockchain. There is widespread agreement among banks, payment processors, software providers, and fintechs that the future of financial services will include cryptotechnologies in some form. But much of the focus on these new technologies is spent on trying to figure out the technical details or on how they differ from legacy payment systems. Far less attention has been paid to practical use cases for cryptotechnologies in finance and a frank assessment of the challenges and benefits these new technologies can bring to banks and other stakeholders.

This paper aims to go beyond current discussions on cryptotechnologies by looking at specific use cases and enablers for using cryptotechnologies in trade finance. While background on how cryptotechnology works and what the trade finance industry looks like today will be provided, the focus will be much more on how cryptotechnologies can help improve trade finance products and services, which specific use cases can be targeted, and a look at both the challenges and benefits that cryptotechnologies can offer for all participants in trade finance.

The Euro Banking Association's cryptotechnologies sub-group of the Working Group on Electronic Alternative Payments[1] has identified two main use cases for cryptotechnologies in trade finance: the exchange of trade data across the entire trade value chain and financing. The use of distributed ledgers for these two use cases could bring immediate benefits to all participants of the trade value chain. These use cases also present an opportunity for banks to craft products and services aimed at the 90% of global trade done on an open account basis, an area that is largely neglected by traditional trade finance offerings today. By maintaining focus on what cryptotechnologies can do and how they can improve trade finance, the EBA hopes to broaden the discussion on cryptotechnologies and spur wider industry discussion on concrete ways in which these new technologies can be used to benefit banks, corporates, and other stakeholders in the trade finance value chain.

3. NOT JUST VIRTUAL MONEY

The sheer number of different cryptotechnologies – as well as terms like distributed ledger and blockchain that are sometimes used interchangeably – can cause confusion among those interested in how these technologies can be used in finance. A lot of attention has been aimed at Bitcoin, the first cryptotechnology to gain widespread recognition and sizable (although still small) adoption. Recently however, a whole host of products, services, and platforms have been developed using distributed ledgers that have expanded the scope of how cryptotechnologies can be used in established industries such as payments and trade finance. The spectrum of cryptotechnologies goes far beyond Bitcoin, beyond virtual currencies, and beyond the blockchain.

Core features of cryptotechnologies

At its core, a cryptotechnology is a shared, uniform ledger that is replicated among all participants over a network of interconnected computers. The security and accuracy of the ledger is assured through the use of cryptography (with multiple different methods available for verifying new ledgers)[2], and control of the ledger is decentralised among participants in the network, meaning that there is no single authority responsible for updating and maintaining the ledger. Once a new ledger is verified, the status of that ledger is fixed and indisputable, offering all participants a single view of an irrevocable ledger. Cryptotechnologies also allow any participant to access the ledger without having to go through a central counterparty, which creates a level playing field among all participants.

With established financial institutions seriously looking into adopting cryptotechnologies, the idea of fully private distributed ledgers has taken hold.[3] These ledgers restrict not only permission to verify new ledgers, but also the ability of nodes to actually read the ledger itself. With privacy of information constituting an essential aspect of banks' business and being a vital part of complex trade agreements between two or more parties, private and hybrid distributed ledgers may very well see increased uptake by established players in finance.

[1] https://www.abe-eba.eu/Working-Group-on-Electronic-Alternative-Payments-N=8cc75aea-89be-4942-8db5-0b693a434918-L=EN.aspx

[2] See Appendix A for more details on cryptotechnology verification, information privacy, and interaction with legacy systems.

[3] https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/

4. HOW BANKS SUPPORT TRADE TODAY

Trade is the lifeblood of the global economy, and banks have long played an important role in mitigating risk and offering financing for both domestic and international trade. Banks help companies finance production and manufacturing, ease working capital, comply with regulations, prevent fraud, and guarantee the credit worthiness of businesses that do not have established working relationships. As trade has become more global, markets have become more competitive, and supply chains have become more complex, financing, risk mitigation, working capital optimisation, and security of funds have become more important than ever for businesses of all sizes.

Trade finance and supply chain finance both provide companies with the funds and security they need to buy and sell products and services both domestically and across borders.[4] The use of open account trading has increased in recent years due in part to the ease of communication and exchange of information between businesses over the Internet. However, even with open account trading, there is still a strong demand for bank services for financing, risk mitigation, and data transfer and matching. These bank services are aimed at reducing the risk both SMEs and large corporates face when trading, such as counterparty risk, the complexity of complying with laws and regulations in multiple jurisdictions, the risk of goods being lost or damaged in transit, and foreign exchange risk.

Banks add value and help customers minimise trade risks in two ways: payment/financing and risk mitigation. Financing involves a number of instruments aimed at helping buyers and sellers secure funding for the production, manufacture, or purchase of goods, to help businesses optimise working capital, and to provide security through payment guarantees. The role of banks in risk mitigation is related to financing, as banks provide credit ratings and payment guarantees that can facilitate trade agreements between two or more parties. Banks also contribute to risk management by ensuring compliance with laws related to AML/CTF and KYC requirements, as well as compliance with international sanctions and embargoes. Compliance issues can be especially important for businesses buying or selling goods cross-border. As regulatory requirements are constantly in flux in many markets around the world, ensuring compliance is a significant enabler of international trade.

[4] For more information, see the Global Supply Chain Finance Forum's "Standard Definitions for Techniques of Supply Chain Finance," 2016.

5. THE EVOLUTION OF TRADE AND HOW CRYPTOTECHNOLOGIES CAN IMPROVE SERVICE

Today, businesses of all sizes participate in global trade. This can lead to logistical complexity and a more acute need to obtain financing and mitigate risk. As open account trading has become more and more popular (making up about 90% of global trade), new instruments and techniques have been developed for risk mitigation and financing. Examples include the digitisation of trade instruments (e.g. the Bank Payment Obligation) the electronification of data related to trade (e.g. essDOCS or Bolero), and integration with ERP systems (SWIFT MT798), and the increasing role of credit insurers in facilitating the shift from letters of credit to open account payment terms. However, despite the evolution that banks and corporates have undergone in trade finance, there are still a number of pain points that can be addressed by cryptotechnologies.

5.1. Most pressing issues in trade finance

The biggest challenge in the evolution of trade is that banks' trade finance offerings are not well integrated into the trading cycle[5]. Banks need a holistic view of a corporate's information flows in trade transactions in order to integrate into the natural flow of data that goes on between a buyer and a seller. Banks could then step in to provide value at certain trigger points along the value chain. A key reason for this lack of integration is the lack of transparency surrounding trade and trade finance today. Trade finance also suffers from costly and time intensive information matching, often with paper documents that can lead to delays in the transfer of goods, initiation of payment, or release of funds as part of a financing agreement. These manual processes, together with the lack of transparency, also raise the risk of error or even fraud in the case of duplicate invoice financing. Industry stakeholders have made efforts to reduce the impact of some of these issues (such as the development of the Bank Payment Obligation ("BPO") for open account trading), but the difficulty with these solutions is two-fold: a lack of adoption and a proliferation of different platforms that lack interoperability.

Without a critical mass of banks and corporates supporting instruments such as the BPO, the use of paper instruments and legacy processes not suited to the Internet age remains widespread. Both parties to a transaction (as well as their banks) must support the instrument or platform offered, and limited adoption will not bring about the network effects needed to transform the industry. The use of different platforms for different elements of a trade transaction (one for financing, one for invoice exchange, one for ownership documentation) also complicates the process. Even if widespread adoption of each service were achieved, interoperability between platforms would still be an issue, and corporates would still have to rely on their bank to access these platforms.

5.2. How cryptotechnologies can meet these challenges

With the majority of trade occurring on an open account basis today, financing and risk mitigation are paramount. Cryptotechnologies can help secure trust among parties in open account trading, help provide credit ratings to improve financing terms, create a level playing field that is transparent to all participants in a trade transaction, guarantee the reliability of data, reduce the risk of errors or fraud, and facilitate the exchange of payments.

Cryptotechnologies offer real-time transparency of data related to all aspects of a trade transaction to each party involved. This includes payment details, transfer of ownership, data extracted from customs documents, invoices, and any other information banks and corporates decide to exchange or store using cryptotechnologies. In addition to improvements in data matching and reconciliation, this can help enhance dispute resolution procedures and help banks manage credit risk. It can also lead to improvements in bank customer service by allowing corporates to inquire on the status of trade and finance information in real time or have access to this information themselves. Particularly for global trade transactions, the ability to offer up-to-the-second status reports on goods and payment flows and alert stakeholders of trigger events that follow this information would be a major improvement over current processes.

[5] Note: This finding is based on discussions between participants in the EBA cryptotechnology sub-group. Sub-group participants include representatives from European banks, payment processors, and global software companies.

While cryptotechnologies hold massive potential to improve services in trade finance, it is important to recognise that it is unlikely that distributed ledgers will replace existing processes wholesale. It is possible that some banks and corporates will utilise cryptotechnologies to facilitate the faster exchange of reliable information and status of goods between parties allowing for more efficiencies, transparency and early detection of financing opportunities while executing payments on established networks such as SWIFT. It is also possible that some information will be stored on separate distributed ledgers. As trade finance players look to the use of cryptotechnologies, the use of open APIs could be a key factor as well as the use of common messaging standards to enable STP of information from legacy systems to distributed ledgers or between distributed ledgers. Seamless interoperability between cryptotechnology solutions and legacy systems will be crucial to improving service in trade finance.

5.3. How do banks fit in?

Cryptotechnologies enable banks to gain a holistic view of a client's information flows and thus offer more targeted services that are better suited to their customer's needs. The fact that the transaction history of each member of a distributed ledger is fully transparent enables banks to audit all participants' transactions and more accurately assess their credit worthiness and potential fraud. This can help build trust between parties that may not have an established trading relationship. Having a more complete risk profile of clients can also help banks to price financing agreements more accurately, and may even result in financing agreements that would otherwise have been seen as too risky due to a lack of information. Banks will also play a role as trusted advisors when clients look to develop smart contracts to facilitate trade.

Far from providing a platform for disintermediation of banks, distributed ledgers offer a number of opportunities for banks to provide added value to corporates. Most trade finance offerings today are focused on the 10% of global trade done using traditional trade finance products such as letters of credit.[6] Cryptotechnologies offer banks an opportunity to target the 90% of global trade done on an open account basis.

[6] https://corporates.swift.com/en/news/trade-industry-meets-mexico-finalise-open-account-trade-instrument

6. USE CASES FOR CRYPTOTECHNOLOGIES IN TRADE FINANCE

The possibilities for cryptotechnologies in the trade finance space are intriguing. But spurring adoption requires much more than recognising that today's processes are lacking and identifying potential technologies that can improve the industry. Banks, corporates, and other industry market participants need concrete use cases in order to develop a business case to push the adoption of cryptotechnologies. Two areas in which we believe cryptotechnologies have the potential to bring rapid benefits to the industry are in the transfer of trade information and financing.

6.1. Exchange of reliable trade information

Enabling trade information to be exchanged or indisputably represented on a distributed ledger would bring major benefits to trade finance. Cryptotechnologies facilitate easy access to data and end-to-end transparency of the entire value chain, which creates a level playing field for all parties involved in a trade transaction. The approval and exchange of data extracted from trade documents such as invoices can be a trigger for events that follow such as the transfer of ownership or execution of a payment. These follow-on events may occur via a distributed ledger or outside of it. The exchange of trade information serves as the backbone for the trade finance workflow, making it an ideal starting point for the use of cryptotechnologies.

Transferring ownership of goods today is a slow process that is not immediately transparent to all participants. Once goods have been approved and ownership is transferred, there is a lag between the transfer being confirmed and matched by all parties and the processes that follow this event (such as a payment) actually taking place. The transfer of ownership can either be triggered by an event (such as the acceptance of an invoice or proof of a payment) or can itself trigger follow-on actions. Regardless of the order in which this takes place (which is stipulated in the trade agreement or smart contract), the irrevocability of each step is paramount. The speed and transparency provided by cryptotechnologies can help ease the process of matching data involved when goods change hands and ensure that all parties to the transaction have a common view of completed transactions. The indisputable nature of distributed ledgers ensures the irrevocability of each transaction.

Using a distributed ledger to exchange and store transaction details (exchange of invoice and shipment data, transfer of ownership, payment, customs clearance, etc.) gives all parties to that transaction real-time visibility of the status of goods along the supply chain. The data that parties to the transaction need to conduct transactions would be available on a distributed ledger, with each individual party (bank, corporate, shipping company, customs office, etc.) holding more detailed information needed to conduct transactions with individual parties in their own systems (not on the common ledger). Distributed ledgers can also help reduce fraud and improve auditability, particularly through the use of smart contracts, which only execute actions after a trigger event has occurred, eliminating the possibility that one party performs a task (initiating payment, releasing goods, etc.) before the necessary trigger event has actually been completed. Smart contracts can also be linked to embargo and sanctions lists to guarantee that funds will not be transferred to banned parties or countries. Going forward, automation of the entire process can be achieved when smart contracts seamlessly integrate with the Internet of Things, for example when shipping containers are fitted with chips that help trigger events when the container changes hands or goes through customs.

The use of cryptotechnologies to exchange trade data can help generate the initiation of payment by a bank. The bank can then decide to send a payment via a distributed ledger or using a legacy system or payment instrument. If a bank decides to use a legacy system, it can immediately store a guarantee of payment on the common distributed ledger to ensure all parties that the payment will be executed. Using cryptotechnologies in trade finance still enables banks to decide how they want to make a payment while giving other stakeholders secure guarantees that funds have been transferred. Having a distributed centralised ledger with information that today requires manual processing and reconciliation can make trade more efficient and transparent, less risky, and facilitate improvements in follow-on services such as financing.

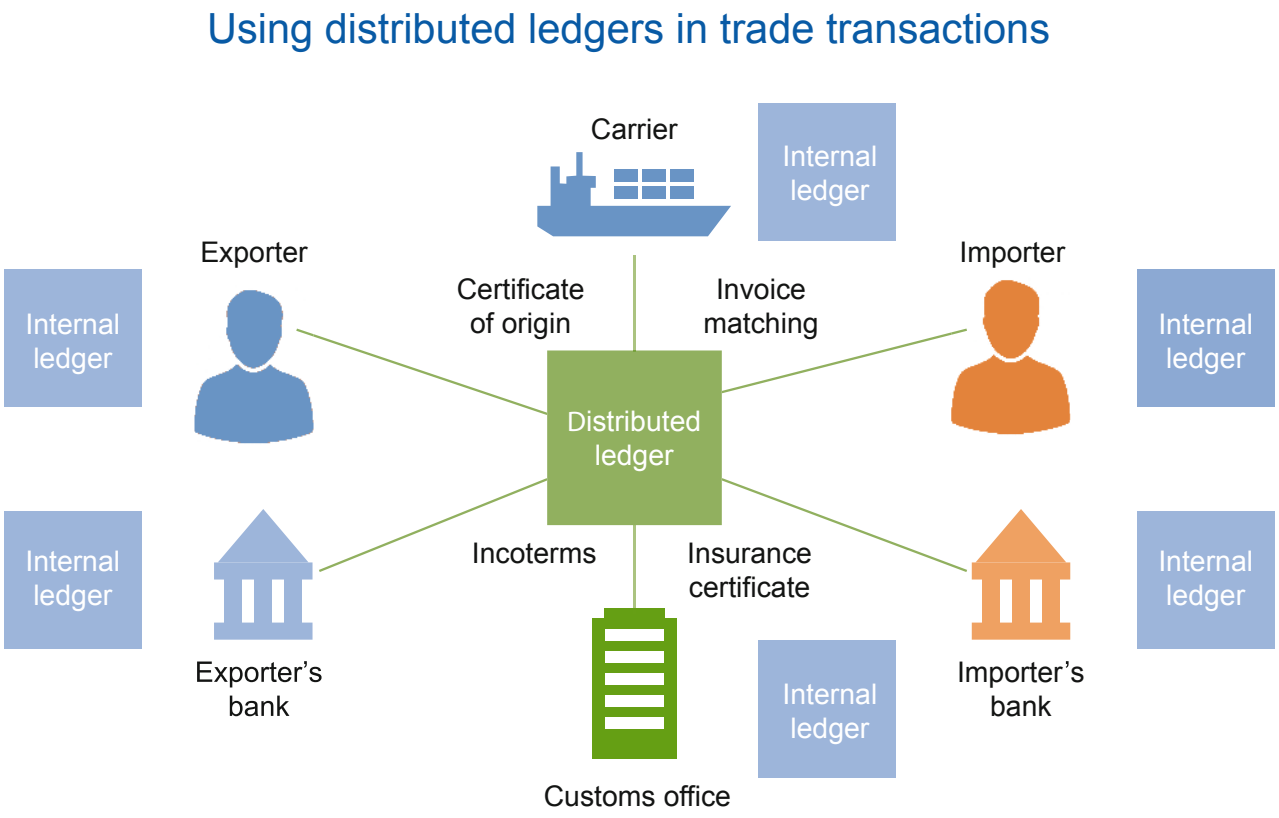

Figure 1: *Using distributed ledgers in trade transactions* (Source: Lipis Advisors)

6.2. Financing

The use of cryptotechnologies to exchange trade data and provide easy and irrevocable data matching and reconciliation would also increase speed, efficiency, and security in financing between buyers, sellers, and their banks. Financing terms and compliance issues will still be agreed to outside of a distributed ledger, but the use of common distributed ledgers can help trigger actions within the framework of a financing agreement.

With real-time visibility of events along a supply chain and the ability of non-bank actors (shipping companies, customs agents, etc.) to update ledgers once a transaction has been finalised, financing triggers can be identified sooner, which means that funds can be released much faster (both between a buyer and seller, as well as to a bank as part of a factoring agreement). As the use of cryptotechnologies in trade finance takes hold, banks can save time and resources by eliminating the need for some of the manual processing and data matching they do today and allow them to focus on more profitable propositions such as financing, which can be vital to businesses involved in both domestic and international trade.

Cryptotechnologies can also benefit trade finance by improving credit ratings and risk assessment procedures, as well as providing a more stable basis for legal recourse. Financing of trade is driven by credit risk. The transparency provided by distributed ledgers enables banks to view the credit history of a buyer or seller that needs financing to better assess this risk. This helps ensure security for the bank and could enable better pricing for a buyer or seller that can prove their creditworthiness to a bank with whom it does not have a pre-existing relationship. The auditability of information exchanged via cryptotechnologies can also help provide a stable basis for legal recourse related to financing. By having both parties to a transaction (buyer and seller) verify an invoice cryptographically on a distributed ledger, the risk of fraudulent invoices and duplicate invoice financing disappears. By adopting cryptotechnologies, banks can adjust their credit policies to help reduce risk and open up new opportunities for financing.

The use of distributed ledgers to exchange data related to transfer of goods and information could also enable more granular payments along the supply chain. Enabling all actors in the supply chain to directly input information into a distributed ledger means that there is more visibility of each step along the supply chain. These events could facilitate smaller portions of financing to be released, thereby unlocking liquidity and reducing the risk of non-payment.

In the long term, it is also possible that cryptotechnologies could be used to provide an open market for the financing of invoices agreed to by two or more parties. The buyer and seller could share an invoice (either the full invoice details or the main stipulations needed for financing) on a distributed ledger and allow banks and third parties to provide competitive financing offers. However, such an open marketplace raises concerns regarding compliance (KYC, anti-trust implications, etc.) and data privacy, e.g. if a bank is named on an invoice that is published on an open marketplace. Nevertheless, the possibility of creating open marketplaces for invoice financing using cryptotechnologies will be an attractive option for corporates and could enable banks to expand their trade finance business.

7. ENABLERS FOR TRADE FINANCE USE CASES

The use of cryptotechnologies to facilitate the exchange of trade data and financing can help improve trade finance services offered by banks to their corporate clients. But there are additional enablers that can further enhance these services. The use of smart contracts and the development of instant payment infrastructures are two such enablers that can help maximise the benefits for banks and corporates using distributed ledgers in trade finance.

7.1. Smart contracts

The transparency of events along the supply chain via cryptotechnologies is itself a major enabler of faster payment and improved financing, increased efficiency, reduced risk of fraud, and lower costs. Exchanging information related to these events in a distributed ledger facilitates trigger events that need to take place for goods to arrive at their final destination and for suppliers to receive payment. But the capability of cryptotechnologies to facilitate these trigger events does not end with the mere exchange of information along a supply chain. The use of smart contracts to not only trigger events but actually carry them out automatically represents a bold evolution that is being actively explored today.

Smart contracts are self-executing computer codes that automatically carry out functions once a triggering event has taken place. It is a linear contract that can include multiple parties (buyer, seller, banks, insurance companies, etc.) and that cannot be altered. For example, if a smart contract is written between a buyer and a seller to say that once goods have been cleared by customs, 20% of the funds will be released to the seller, a smart contract would automatically disburse payment once confirmation is entered into a distributed ledger that the customs office has cleared the goods. The confirmation of approval by customs is not a triggering event requiring action by a bank; the payment is automatically made once confirmation has been entered into the system. With a smart contract, legal stipulations are embedded in the computer code, which enables the automatic execution of functions defined by a legal contract. It also provides protection against duplicate

invoice financing, as the contract will not allow for an invoice that has already been financed to receive additional financing.

A smart contract therefore acts as an application layer that is built on a cryptotechnology platform. The development of cryptotechnology applications that support smart contracts is already underway in a number of markets, most notably by the Thorium project.[7] Some see smart contracts as the future of cryptotechnologies,[8] as they enable more efficiencies in legal contracts through a decrease in manual processing and initiation of contract terms, risk reduction through the elimination of manual errors and duplicate invoice financing, and could make value propositions such as micropayments more feasible.

Banks will play an important role as advisors to their clients while developing smart contracts. The terms of a smart contract have to be worked out between the parties before the smart contract is developed, and banks will also have to perform compliance checks such as KYC procedures before embedding the legal contract in code. Today, legal and regulatory issues surrounding smart contracts are still unclear in many jurisdictions, and many companies exploring the use of smart contracts are still in the proof of concept stage. As the technology matures, standardisation of smart contract terms is explored, and successful adoption of smart contracts grows, their use in trade finance could bring even more benefits to all stakeholders along the supply chain.

7.2. Instant payment infrastructures

The development of instant payment infrastructures is another key enabler that will add speed and efficiency to trade transactions. Almost 20 countries around the world have already implemented instant payment infrastructures, and major markets such as Australia, the United States, and the Eurozone[9] are in the process of developing and testing instant payment systems. With the ability to send and receive domestic payments within seconds, the movement of money triggered by events along the supply chain can proceed more rapidly, which means that shipping companies, customs offices, and sellers have quicker access to funds. Instant payments can also enable both buyers and sellers to obtain funding from their banks faster than they do today, which can lead to a further optimisation of working capital and unlock liquidity from supply chains.

[7] https://www.ethereum.org/

[8] http://www.americanbanker.com/bankthink/smart-contracts-are-the-future-of-blockchain-1078705-1.html

[9] https://www.ebaclearing.eu/Blueprint-on-Instant-Payment-Solution-N=Blueprint-Instant-Payment-Solution-L=EN.aspx

8. CHALLENGES TO USING CRYPTO-TECHNOLOGIES IN TRADE FINANCE

While cryptotechnologies have high potential to add value for banks and corporates in the trade finance space, there remain a number of challenges to the successful adoption of cryptotechnologies. Some of these issues are specific to the use of cryptotechnologies in trade finance, while other issues apply to the use of cryptotechnologies in general. Industry cooperation and active engagement with these issues will be key to overcoming these chal-lenges and bringing about the successful implementation and adoption of cryptotechnologies.

8.1. Regulatory and security issues

With the use of cryptotechnologies still in its infancy, it is unsurprising that the regulatory frameworks surrounding their use remain unclear. Combine this with the fact that cryptotechnologies themselves are a technological innovation that have only been possible for a few years, and there seems to be an uphill battle ahead to craft laws and regulations that will ensure a stable playing field for industry stakeholders looking to adopt cryptotechnologies. Regulatory compliance is a key issue for banks, and as long as they are unsure of how regulators view the use of distributed ledgers in finance, they are unlikely to make it a backbone of how they provide products and services to their customers. While regulators in some countries such as Australia[10] have signalled their openness to the use of cryptotechnologies, what banks and corporates need is concrete rules to reduce the risk of regulatory action. Banks, fintechs, and corporates could engage with regulators to help educate them on how cryptotechnologies work and how they can be used to benefit end users while maintaining the security and stability of payment systems.[11] In addition to the need to clarify regulatory aspects that affect all industry stakeholders, banks will have to look at their own internal risk management policies and determine whether changes need to be made to accommodate the use of cryptotechnologies.

One of the most vital areas of regulation that banks have to comply with (particularly in international trade) is Know Your Customer (KYC) requirements, anti-money laundering/counter-terrorism financing (AML/CTF) regulations, and sanction and embargo lists. Banks that fail to adhere to these rules risk fines from regulators and possible criminal charges. Compliance with KYC and AML/CTF legislation is a key benefit that banks offer their corporate clients. In order for the use of cryptotechnologies in trade finance to be a success, banks must ensure that the information requirements that currently apply to payments and trade are met on distributed ledgers. The key question for banks and regulators here is whether KYC and AML/CTF procedures need to be updated for distributed ledgers, or whether these technologies will be seen as just another network that can be shown to be compliant with established laws and regulations.

The security of information on cryptographic ledgers will be another key issue for banks, corporates, and regulators. Legacy payment systems and financial information networks such as SWIFT have a proven record of ensuring that data can be transferred securely both for domestic and cross-border payments. The use of permissioned ledgers, where trusted nodes verify transactions, could assuage some security concerns, but some stakeholders will have to be convinced that information exchanged and stored on distributed ledgers is as secure as information held in proven networks. Banks, corporates, and regulators will need to be educated on the security of distributed ledgers and on public key cryptography, and this security will have to be demonstrated via proofs of concept.

8.2. Confidentiality, technology and network effects

For both banks and their customers, confidentiality of information is a fundamental issue. Information related to the commercial terms of a trade must remain strictly confidential between the parties to that

[10] http://www.afr.com/technology/rba-governor-glenn-stevens-backs-blockchain-and-tech-disruptors-20151215-glnsnm

[11] This is already happening in the UK, where the Government Office for Science has already been looking into the use of distributed ledgers in a number of areas. This is a welcome first step that will hopefully lead to the development of regulations and legal precedents that spur the adoption of cryptotechnologies. For more information, please see: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf

trade. Even if the information exchanged using cryptotechnologies is proven to be secure, banks and corporates may still be wary about exchanging certain information over a decentralised, public ledger. As such, it may be decided that some information related to trade is exchanged via a distributed ledger, while other information is stored outside of the distributed ledger. The challenge then is which information should be exchanged via decentralised ledgers, ensuring trust in the confidentiality of that data, and how to access information that is stored and exchanged outside of this ledger. There has already been some movement on this front such as the Corda solution from R3, which will enable participants to keep certain data confidential even as it is stored on a global distributed ledger.[12]

The pace of technological change rarely overlaps with the rate of technological adoption. By removing the need for a central counterparty and enabling the global exchange of information in real time, cryptotechnologies are a truly revolutionary development. As such, many actors may have concerns about whether or not cryptotechnologies provide a stable technological basis for financial products and services and whether or not these technologies can scale as transaction volume grows. Furthermore, cryptotechnologies are constantly undergoing change and releasing updates. A quick look at the history of Bitcoin updates shows this trend, with 37 versions of the Bitcoin Core program being released in under five years.[13] A vital aspect of whether or not distributed ledgers are stable enough for adoption by banks and corporates is the question of scalability. This issue has been a focus of proof-of-work solutions such as Bitcoin.[14] Many organisations developing distributed ledger solutions for use by financial institutions have made this concern a key focus, but these solutions will have to prove that these networks are capable of handling the scale of transactions that banks deal with on a daily basis.

All of these challenges are likely to contribute to the biggest hurdle facing the use of cryptotechnologies in trade finance: the need for a network effect to ensure that the use of these technologies is truly beneficial. Other attempts at modernising trade finance, such as the use of the SWIFT MT798 standard and the development of the Bank Payment Obligation (BPO), have seen low adoption rates due to challenges related to investment and integration in existing systems.[15] While it is possible that cryptotechnologies will see more adoption due to their flexibility and wider scope of potential use within banks, the benefits that distributed ledgers can bring to financial institutions and corporates will be dampened if a critical mass of adoption is not reached. If one bank uses distributed ledgers and another does not, a trade transaction involving those two banks will have to rely on legacy products and networks. Interoperability between distributed ledgers (as well as between distributed ledgers and legacy systems) will be key to enabling network effects that can produce benefits for all stakeholders. As banks and others look to the use of cryptotechnologies in trade finance, they should focus on how to bring industry participants together to create a network effect for cryptotechnology platforms.

[12] http://r3cev.com/blog/2016/4/4/introducing-r3-corda-a-distributed-ledger-designed-for-financial-services
[13] https://bitcoin.org/en/version-history
[14] http://fc16.ifca.ai/bitcoin/papers/CDE+16.pdf
[15] Boston Consulting Group, “Embracing Digital in Trade Finance,” 2012.

9. BENEFITS TO BANKS AND THEIR CUSTOMERS

Banks and corporates would be wise to take a strategic approach to exploring the use of cryptotechnologies in trade finance as they look to overcome the challenges of adoption. Distributed ledgers can help banks meet customer expectations by improving product offerings and increasing speed and transparency while lowering costs and helping avoid the threat of disintermediation by third parties. Corporates stand to gain by optimising the use of liquidity, increasing transparency and convenience, and seeing new financing opportunities.

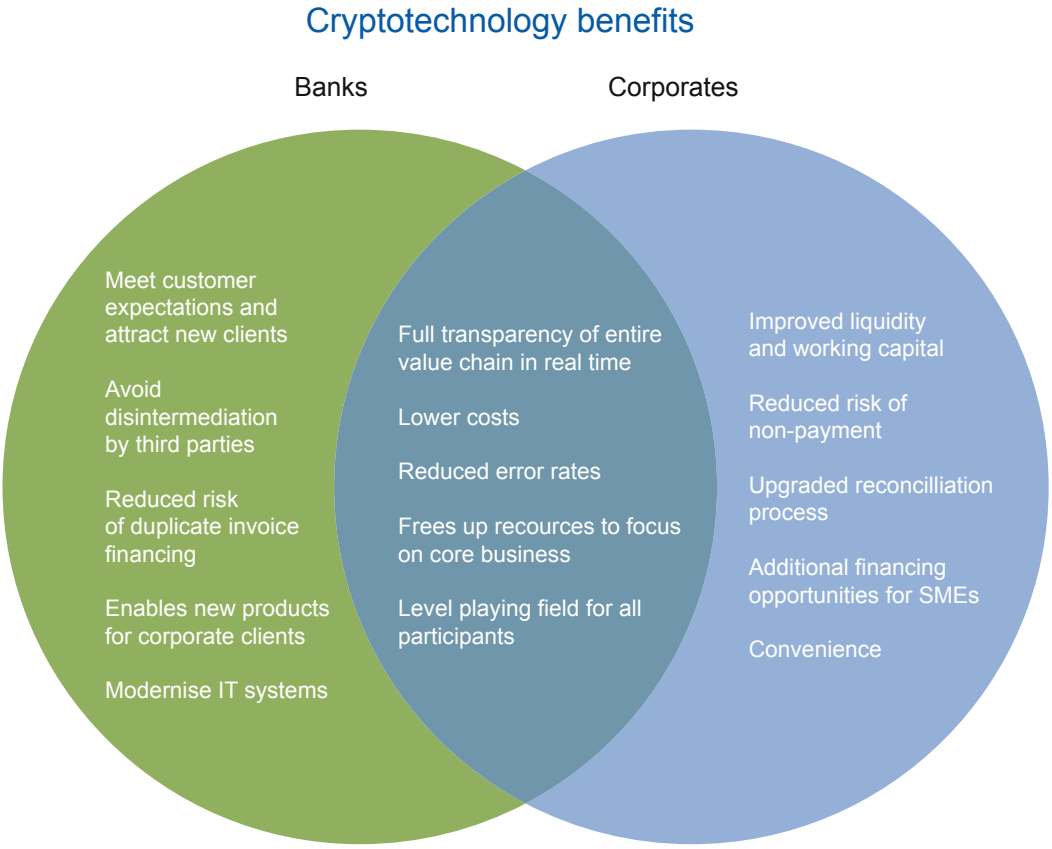

Figure 2 *Cryptotechnology benefits* (Source: Lipis Advisors)

9.1. Benefits to large corporates and SMEs

Perhaps the biggest benefit corporates stand to gain from the use of cryptotechnologies is improved liquidity and working capital. By enabling the instant electronic transfer of trade information orchestrated by smart contracts, payment can be triggered automatically, resulting in quicker payment to sellers. A business' liquidity position can also be improved via better financing opportunities due to the transparency that distributed ledgers provide. Particularly for SMEs that may have trouble obtaining financing for invoices, cryptotechnologies could help create an open market for financing that allows banks to compete for financing terms once transaction terms have been agreed between two parties. Faster payment and improving financing opportunities can help businesses maximise their working capital to secure liquidity and grow their business.

Cryptotechnologies can also greatly improve reconciliation for corporates both large and small. Today, reconciliation is an unwieldy process that involves manual matching of paper-based trade and payment documents. In addition to the increased chances of errors in processing, the process today is both time- and resource-intensive for both banks and corporates. Cryptotechnologies could radically simplify this process by enabling automated reconciliation and

matching of trade and payment information, with full transparency of the entire end-to-end value chain available to all parties to the transaction. This allows all participants to have real-time visibility of completed and outstanding transactions without the use of multiple copies of paper instruments. The real-time visibility and ability of all participants in a transaction to update the ledger also creates a level playing field that does not exist today. Instead of having to rely on a central counterparty to maintain a ledger and provide information to different stakeholders, cryptotechnologies enable multiple gateways to an indisputable ledger. This not only enables faster actions to be taken by different parties; it also boosts convenience for all participants by giving them real-time access to reliable information surrounding the entire trade flow.

The time and money saved on reconciliation and financing allows corporates to shift focus to their core business. The gains in speed and efficiency that come with the use of cryptotechnologies can help corporates reduce overall costs by eliminating some manual processing and lowering the risk of errors. Improved financing opportunities can help corporates unlock liquidity that was previously tied up in supply chains. These benefits can be realised in both domestic and cross-border environments for both large and small businesses. As global trade becomes the norm and supply chains become more complex, cryptotechnologies can improve service to corporates.

9.2. Benefits to banks

Banks also stand to reap benefits from the use of cryptotechnologies. The most important benefit to banks comes from meeting the needs of their customers. By offering products and services that help increase working capital, reduce risk, ease reconciliation, and lower costs, banks stand to retain existing customers and potentially attract new customers. The use of cryptotechnologies and the services they enable can be a differentiator when a corporate is looking for a banking partner in trade finance. This has the added benefit of helping banks avoid disintermediation by third parties, many of which do not have to deal with the legacy IT systems and processes used by larger banks. As many banks struggle to innovate in an industry where regulatory compliance and risk management is key, cryptotechnologies could provide a tool that helps banks stay competitive with agile new entrants.

Cryptotechnologies can also facilitate the development of new products and services. Trade finance is an important source of revenue for banks, but corporates are increasingly wary of traditional instruments (such as letters of credit) that feature high transaction fees. This has led in part to more trade being done on an open account basis.[16] Such high transaction fees are mainly due to the complicated manual processes involved in reconciling paper documents. Cryptotechnologies offer an opportunity for banks to develop new products that utilise the speed, transparency, and efficiency that distributed ledgers enable. Cryptotechnologies could be leveraged to help provide liquidity forecasting tools and working capital analytics to corporate clients, which serve both to meet their changing needs and provide new sources of revenue as the high transaction fees seen in traditional trade finance become less attractive to corporates.

The benefits banks stand to gain from cryptotechnologies are not all directly related to serving their customers' needs. Cryptotechnologies also present an opportunity for banks to lower processing costs and modernise internal IT systems, many of which feature complex silos due to outdated IT architecture and the melding together of systems that occurs when banks consolidate. By reducing the amount of manual processing involved in trade finance and minimising the costly use of paper instruments, cryptotechnologies can provide real cost savings to banks both in trade finance and in other areas such as payments or cash management. In turn, this can enable banks to focus on core aspects of their business such as financing and lending, which will increase overall bank revenues.

[16] https://www.accenture.com/t20160301T033343__w__/us-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Dualpub_21/Accenture-Trade-Finance.pdf

10. FUTURE OUTLOOK

Although still in the early phase of adoption, cryptotechnologies can add significant value to both banks and corporates in trade. These technologies can help increase speed and transparency in trade transactions, reduce risk and error rates, lower costs, improve liquidity and working capital, and enable the development of new products and services. A gradual approach to adopting cryptotechnologies can be taken by focusing on specific use cases and building upon these as challenges are overcome and customers see the value in distributed ledgers for their trade business. But banks should also be aware that a more full-scale adoption of cryptotechnologies will result in more wide-reaching benefits. The use of smart contracts to carry out complex functions of trade agreements can provide additional efficiencies, faster processing, and reduced risk and error rates. Smart contracts could also interact with other elements of the supply chain, such as electronic chips that track containers as they are shipped. Using distributed ledgers to create an open marketplace for the financing of invoices between a buyer and a seller is already being explored, and can spur competition among banks and third parties.

While some of these developments could be seen as a threat to traditional business models, banks could see many new revenue opportunities by embracing distributed ledgers and the potential they bring to transform trade finance. Although mass adoption of cryptotechnologies will not happen overnight, banks would be well served by actively exploring their use today. Indeed, some solutions based on smart contracts are due to go live in the next one to two years. As adoption grows and corporates begin demanding these solutions, banks that embrace cryptotechnologies and incorporate them into their business are likely to be the main beneficiaries.

APPENDIX A: CRYPTOTECHNOLOGY VERIFICATION AND INFORMATION PRIVACY

Verification methods

There are multiple different methods used to verify new copies of the ledger, but two methods have emerged as the most common: proof-of-work and consensus algorithms:

- The proof-of-work method enables any participant in a network to attempt to independently solve a mathematical operation in order to verify and update the ledger. As more participants contribute to solving these equations at regular intervals, the difficulty in solving the equations increases, thereby increasing security in the network. Proof-of-work is most notably used by Bit coin, where it is typically referred to as "mining," and is used for unpermissioned ledgers.

- Consensus algorithms differ from the proof-of-work method in that it relies on trusted nodes in the network to verify new ledgers. The Ripple protocol uses this method, and trusted parties are determined based on what kind of institution they are (large banks and other financial institutions) and geographic disparity so as to make collusion extremely unlikely. Some see consensus algorithms as advantageous compared to proof-of-work ledgers because they require less computing power while ensuring security, speed, and accuracy of new ledgers. Consensus algorithms are only feasible in permissioned ledgers.

Distributed ledgers can be either "unpermissioned," meaning that all participants in the network (also known as nodes) can verify new ledgers at appointed time intervals, or "permissioned," where only trusted parties in the network verify new batches of transactions. Permissioned ledgers often allow users to select groups of trusted parties individually, or to use nodes that have been verified as trusted parties by other participants.

Information privacy

As interest in cryptotechnologies has grown from banks and software vendors looking to improve existing services, lower costs, and develop new products for their customers, questions have been raised about how cryptotechnologies interact with legacy systems and networks and how these technologies can be adapted to conform with issues such as regulatory compliance and information security. The idea of having a decentralised public ledger where all participants can see every transaction (even if participants on the ledger use pseudonyms to transact) is a cause for concern, particularly in trade finance.

The full cryptotechnology spectrum

In its May 2015 report "Cryptotechnologies, a major IT innovation and catalyst for change", the EBA identified four categories of cryptotechnology applications: currencies, asset registries, application stacks, and asset-centric technologies.[17] Currency applications such as Bitcoin involve both the creation and exchange of value over distributed ledgers, typically on fully decentralised, unpermissioned ledgers. Asset registry technologies such as Omni and Counterparty actually build software layers on the Bitcoin blockchain in order to register assets that exist apart from the blockchain such as stocks, vehicles, or buildings to enable a registry of these assets without a central counterparty.

Application stacks use decentralised ledgers to create platforms that enable the development of applications such as smart contracts. NXT and Ethereum have developed application stacks using cryptotechnologies that enable the exchange of assets and currencies, as well as further applications such as data storage and voting. The final cryptotechnology category identified by the EBA, and the category seen as having the most compelling use case in the near term, is asset-centric technologies. These technologies use distributed ledgers to enable the exchange of digital representations of existing assets without a fully public ledger. These technologies facilitate faster processing and settlement, and can be used both internally within a single organisation and externally between stakeholders. The EBA points out that regulatory and technical maturity issues that affect currency, asset registry, and application stack cryptotechnologies are less relevant to asset-centric technologies at this time.

[17] https://www.abe-eba.eu/downloads/knowledge-and-research/EBA_20150511_EBA_Cryptotechnologies_a_major_IT_innovation_v1_0.pdf

APPENDIX B: GLOSSARY OF TERMS

AML
Anti-money laundering

Application Program Interface (API)
An API is a set of rules, standards, and protocols that specify how different software components interact in order to exchange data.

Bank Payment Obligation (BPO)
An inter-bank instrument used to secure payment against the successful matching of trade data. The BPO is similar to a letter of credit, with the main difference being that data is matched electronically (which leads to quicker matching, lower cost, and greater efficiencies). BPOs are typically used in open account trading.

Blockchain
A type of cryptotechnology that uses cryptographic methods to record new sets of transactions in "blocks" that are verified at specific intervals. Once a new block is verified, it is "chained" to the previous block. The chained blocks create a uniform distributed ledger. Blockchains often allow any participants in the network to verify new sets of transactions, but verification can also be limited to specific parties. A blockchain is a distributed ledger, but not all distributed ledgers are blockchains.

Bolero
A company that offers electronic document presentation and settlement for the trade finance market. It ser-vices both corporates and financial institutions, and has a number of electronic solutions aimed at open account trade, letters of credit, and other trade document information.

Cryptotechnology
A shared, uniform ledger that is replicated among all participants over a network of interconnected computers, with the security and accuracy of the ledger assured through the use of cryptography (instead of through verification by a central counterparty). Cryptotechnology is an umbrella term that includes terms such as distributed ledger and blockchain. Cryptotechnologies feature a variety of verification methods, and can include ledgers that are public, private, or a hybrid of the two.

CTF
Counter-terrorism financing

Distributed ledger
A type of cryptotechnology that uses trusted nodes to verify new sets of transactions on a continuous ledger (as opposed to linking "blocks" of transactions as is the case in a blockchain). These verified ledgers are distributed across a network of computers, and are typically public to all participants in the ledger. Many distributed ledgers restrict the right to verify new ledgers to trusted parties.

Duplicate invoice financing
A fraudulent practice whereby a buyer or supplier obtains financing for a single invoice from multiple parties.

Enterprise Resource Planning (ERP)
A set of business planning software that allows companies to manage and automate business functions such as cash management, human resources, payroll, etc.

essDOCS
A company specialising in electronic trade documentation aimed at electronifying trade documentation and financing solutions. essDOCS claims to have the world's largest electronic bill of lading network.

Fintech
A company focused on using technology to automate and improve financial services.

Instant payment
The Euro Retail Payments Board at the European Central Bank defines an instant payments as "electronic retail payment solutions available 24/7/365 and resulting in the immediate or close-to-immediate interbank clearing of the transaction and crediting of the payee's account with confirmation to the payer (within seconds of payment initiation). This is irrespective of the underlying payment instrument used (credit transfer, direct debit or payment card) and of the underlying arrangements for clearing (whether bilateral interbank clearing or clearing via infrastructures) and settlement (e.g. with guarantees or in real time) that make this possible."

Internet of Things
A network of physical objects that communicate with each other and exchange data using electronic sensors or software via cloud computing.

KYC
Know Your Customer

Node
A participant in a cryptotechnology platform. Some nodes also help verify new ledgers (distributed ledger) or blocks (blockchain).

Open account trade
A trade transaction where the goods are shipped before payment is due. This type of trade is advantageous to a buyer because it saves liquidity, but comes at higher risk to the supplier. It is estimated that 90% of global trade occurs on an open account basis today, and banks have updated product offerings to provide financing and risk mitigation on open account terms.

Smart contract
Self-executing computer codes that automatically carry out functions once a triggering event has taken place. Smart contracts implement legal code into technical code, and act as an application layer built on a cryptotechnology platform.

SME
Small- and medium-sized enterprises

STP
Straight-through processing

Supply chain finance

The use of financing and risk mitigation practices (almost always on an open account basis) to optimise the management of working capital and liquidity invested in a supply chain. Visibility of underlying trade flows by the finance provider is a necessary component of supply chain finance, and is usually enabled by a technology platform.

SWIFT MT798

A SWIFT messaging standard that allows corporates to integrate all trade transactions into an ERP system to gain a single, consolidated view of all trade transactions.

Trade finance

An umbrella term that describes a range of traditional trade finance techniques and services offered by financ-ial institutions to corporate clients, much of it using paper instruments. Today, only about 10% of global trade is done using traditional trade finance techniques.

APPENDIX C: FURTHER READING

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