

DLT and digital tokens: opportunities and challenges

1. Current development of DLT solutions and lessons learned

1.1. Current development of distributed ledger technology (DLT) applications in the market

An official explained that DLT is a way of recording and sharing data (e.g. a record of transactions or a set of account balances) across multiple data stores (also known as distributed ledgers), which each have the exact same data records and are collectively maintained and controlled by a distributed network of computer servers, which are called nodes. One of the key elements of the DLT proposition is that there is no need to rely on a trusted intermediary¹ for the performance of these activities, necessitating trust in the technology and underlying algorithms (see Appendix for further detail on the concepts related to DLT). DLT may strongly impact financial services activities, but it is still unsure whether this will eventually happen on a wide scale. While some have propagated the idea that distributed ledgers will be a core feature of the financial sector going forward, others are sceptical about the potential of DLT. There has been an abatement of the hype surrounding DLT and blockchain over the last few months, which may be due to more detailed reflection upon their applications.

A Central Bank official outlined that the “Gartner Hype Cycle” applies to DLT: after the development of the initial idea, there was a hype phase. This may now be subsiding to the following phase of disillusionment which normally precedes a more stable state of realism. The speaker however remains very positive regarding this type of innovation. More needs to be done to understand how to realize its full potential and Central Banks in particular are building blockchains to do this. It can bring about greater efficiency, improve the functionality of the markets and improve financial stability, as it can help to solve liquidity problems. With Brexit, Europe faces more fragmentation across various financial marketplaces. Blockchain could also help to bring the liquidity of the different European financial marketplaces together.

An industry representative stated that their company, a financial market infrastructure, has launched a bilateral payment netting service using DLT². Several major market participants are utilizing the service, and participation is growing. The service’s functionality has been based on DLT rather than conventional technology to allow the company to be in the DLT space and to better understand DLT’s potential. Although there is less talk about DLT today, the potential of the technology is very powerful and should be supported. This service is, however, a targeted application and the company chose what it thinks is an appropriate service to apply DLT. The company has not put its core service on DLT, as to do so would

be a risk and potentially ‘a bridge too far’. The technology needs to mature and develop in sensible increments.

Another industry representative confirmed that their company – a major post-trading service provider - has not put its core settlement services on DLT either. The initial predictions, that the whole post-trade industry would be replaced by DLT in a couple of years, did not materialize and major players in the post-trading industry have actually reached an all-time high in revenues in 2018. This does not mean that DLT is not a promising innovation, but it is not ready to replace existing technologies or fundamentally reshape the functioning of clearing and settlement infrastructures. The industry representative agreed that in the maturity steps of every innovation there is a phase of euphoria. This phase has probably passed, and a more realistic approach has now been adopted. This is good, because this realistic approach enables the barriers and obstacles to be identified and tackled to make progress. These developments have been positive for the speaker’s firm as they have helped it to gain knowledge of what it can and should do to progress.

A regulator observed that there is generally a consensus that it is too early to fully leverage the potential benefits of DLT. As DLT solutions are gradually implemented, they offer new opportunities but also raise challenges which must be addressed. The speaker agreed with previous remarks that an implementation of DLT in financial markets has the potential to increase efficiency, enhance the post-trade process and reduce the cost of financial services for providers and users.

1.2. Lessons learned and conditions of the further development of DLT in the financial sector

An industry representative observed that DLT has done itself an enormous disservice by trying to sell itself on the possibilities of the ultimate end state. DLT is a powerful technology for: storing data and transaction records in a way that is common and shared; implementing smart contracts; and streamlining processes. The representative’s firm has learned a number of lessons with the application of DLT. First, implementing new technology is operationally very difficult. The number of PoCs (proofs of concept) happening in the market is not a valid indication of the operational challenges. The real test of the success of a technology is how many people are taking it to enterprise level and building it in a way that the market will trust and use. Second, DLT application should focus on operational functionalities. Business lines want functionality and not necessarily a DLT-based product. Third, integration of DLT applications into existing environments must happen safely because DLT applications cannot exist in isolation. Fourth, technology, particularly DLT, requires

¹ The execution of financial transactions normally requires a third-party intermediation e.g. a securities settlement system, a custodian, a trade repository. DLT involves decentralizing trust and enabling decentralized authorisation of transactions.

² The service aims to increase the levels of payment netting calculations while introducing standardization and automation. The aim of the product is to drive operational process efficiencies, such as optimizing intraday liquidity, enabling real-time awareness of currency and counterparty exposures, and reducing risk.

a network. Networks need simultaneous store of data and a sufficient number of nodes, without which the value of DLT is questionable. The most important aspect, however, is that there must be an operator of the system, as is the case with permissioned systems (see Appendix for a definition). The idea of a non-permissioned ledger and trusting the technology, and not a central person, was initially put forward with bitcoin. A ledger does not need to be centralised, but it is important to know who to turn to in case of problem or to improve the system (particularly if DLT is going to be used at a certain scale in financial services). Knowing who to turn to is particularly important in relation to cross-border activities.

Another industry representative observed that there are many conditions regarding the further development of DLT in the post-trade sector in particular. First, it should add value to the existing service that is offered in terms of efficiency, speed and costs. It should also ensure at least the same level of safety, security and integrity as the present system, since the post-trade industry and the market as a whole will not make any kind of trade-off on these aspects. Without this guarantee, the post-trade market will not move towards DLT.

The representative further observed that it should be proved that there are possibilities for this technology to scale up and absorb all or part of the existing volume on the market because at present DLT developments are limited to quite small compartments of the market. Another condition is providing sufficient transparency for supervisory purposes. There are also some legal issues to solve, and work is ongoing to identify any need for the adaptation of existing regulations. In the settlement area, there are two main regulatory components: the Settlement Finality Directive and the Central Securities Depositories Regulation (CSDR). If a DLT system is providing services governed by CSDR, it should take the setup of a proper CSD. This could be an obstacle in terms of requirements, but that is the price for entering the game.

The paradox with the possible use of DLT in securities post-trading, the speaker believed, is that, while DLT systems are normally well adapted to these processes because registers are being monitored for a closed or limited number of participants, the activities of the industry are so critical to the market and the level of safety needed is so high that it is not an area where trial and error is acceptable, making it difficult to implement DLT systems in the first place.

A Central Bank official stated that while Central Banks are very interested in how the future role of banks will develop with this technology, they are also concerned by the stability and control issues that their use involves in an industry as regulated as finance. Blockchain is indeed one of the few technologies which could disrupt Central Banks with some of its applications. Supervisors are also concerned about potential risks related to the use of DLT and would not accept the kind of “anarchy” that was initially intended with bitcoin. For it to work, particularly given its cross-border characteristics, there is the need for someone to be responsible in the system. Applying DLT to finance is different from other areas, because the sector carries greater risk. There must be people to monitor these risks and ensure a certain reliability of the technology, checking whether there are flaws or cheats.

Another official observed that the limited scale of DLT applications so far also raises the question of whether this is due to insufficient standardisation and interoperability concerning DLT solutions and whether other elements may be missing such as the possibility to integrate assets and the cash side on ledgers.

A Central Bank official considered that it is too early to say whether there will be standardisation and a widescale

development of these technologies. Their potential and end benefits are still being probed. There may be different kinds of DLT in the end, in which case interoperability will be needed and the industry is already starting to think about the interoperability of the different technology sets.

1.3. Prospects of digital tokens to support DLT systems

An official suggested that distributed ledgers can particularly benefit from the concept of digital tokens. Digital tokens being representations of assets – potentially of cash – offer the possibility to integrate the asset and cash sides in the distributed ledger environment. That may lead to more widespread usage of DLT, because at present there are aspects of the provision of cash settlement which may not yet be suitably served from a market perspective.

An industry representative observed that problems with transferring value are a recurring criticism of DLT. If there is a significant amount of activity on a ledger, it would be good to have a store of value on it. However, that does not have to be achieved on day one for the technology to show its use.

Another official noted that the BIS does not view cryptocurrencies positively, and this includes digital tokens to a certain extent. This having been said, all settlements involve a cash and an asset leg and in the future it could be necessary for digital tokens to be involved in one or both of the legs. It is hard to put a suitable solution in place, one of the reasons being that it would be preferable if the cash leg could continue to be in Central Bank money. Surveys of how Central Banks are handling digital currencies and tokens show that while 70% of them are experimenting with DLT and digital tokens, very few are considering actually issuing such assets in the short to medium-term. The challenge for the industry will be that if only one side of the settlement transaction is working on DLT (the asset leg) this will cause uncertainty as to how the two sides can be made to inter-connect. There is also uncertainty as to whether the settlement system can work without Central Bank money issued on a ledger.

A Central Bank official considered that digital means of payment will need to be available on DLT systems in any case if they are to develop more widely. For example if distributed ledgers are used to support sales processes, there must be a technical possibility to send the money back. Therefore, as the DLT develops in other fields it will automatically bring about payments on the internet, which makes it necessary to be attentive to the currency issues and ensure that they are solved in parallel.

Another Central Bank official observed that there are many on-going assessments and PoCs in Asia concerning the use of DLT and blockchain technology, which should lead to reviewing the whole architecture of incumbent systems including the cash side and assessing ways to improve their efficiency, which would be a starting point in the region.

2. Risks posed by DLT and current policy approach at the EU level

2.1. Main risks and challenges posed by DLT remaining to be tackled

A regulator observed that possible issues and threats related to DLT technology include cyber-attacks, potential performance challenges of the technology and the higher degree of interconnectedness that DLT could lead to, potentially raising market volatility risks. Concerns have also been raised over some grey areas not regulated under current legislation and which may prove difficult to regulate due to various features of DLT platforms. There are local standards or standards specific to certain platforms, but these are not mature yet.

A first question is that of which jurisdiction rules should refer to, since DLT platforms are a decentralised structure made up of multiple nodes potentially located in different jurisdictions. Since there is no central entity in this network, it is unclear which legal framework is applicable to it. There is also the question of the legal framework applying to transactions and services managed on the platform. With regard to the attribution of risk and liability in relation to faulty DLT services, this must take into account all parties involved. Another issue is the handling of data privacy, as DLT may increase the level of transparency beyond what is suitable. Property of the information in the database can also be a problem as well as consent of people whose data is on the ledgers.

Questions are also raised about the standards applying to smart contracts used on DLT platforms. These are contracts which are automatically executed when certain pre-specified criteria embedded into the contract are met. Using DLT eliminates the need for intermediary parties to confirm the transaction, leading to self-executing contractual clauses. It is also important to have greater user responsibility, since many existing DLT systems have no central authority to go to in the event e.g. of individuals losing private keys or incurring losses as a result of revealing a private key. Also, there are no features to restore forgotten passwords and usernames, as exist for other products and services.

An official emphasized that the cash settlement side on the DLT is another area of concern. Cash has so far had a consistent legal environment, generally considered as a claim against an account provider, unlike securities, which have differing legal qualifications across jurisdictions. With tokenisation this may change and there may be a phase where the legal context of cash, broadly speaking, will be more fragmented than at present.

2.2. Existing policy approach at the EU level regarding fintech and DLT

An official observed that there are many ongoing attempts to enhance the regulatory environment pertaining to DLT and crypto-assets, and some EU member states have either already taken action to adopt laws or have projects to modernise their laws in those fields with the aim of enhancing legal clarity and removing regulatory obstacles. This may carry a risk of fragmentation and piecemeal approaches. Efforts have been made at the European level, in particular by the Commission, to improve the framework applying to fintech and digitalisation, with the fintech action plan and more recently the launch of the joint forum of the supervisory authorities, to combine efforts undertaken regarding sandboxes and incubators.

A regulator agreed that a legal framework is necessary, as it brings clarity and moves DLT into a better-defined space. The question, however, is of when is the right time to take this step at the EU level. Member states have taken different approaches to regulating DLT technology. Some, such as Malta, have decided to regulate DLT technology at the domestic level, with the aim of providing clarity on the classification of DLT or improving some licensing requirements. Many states are more reluctant and would prefer to wait until there is a tried and tested legal framework at the European level. The regulator supported the principles-based approach presented by the Commission regarding fintech in general, which also applies to DLT based on three key principles: technological neutrality, proportionality, and market integrity. Supporting the scaling up of technological innovation in the financial sector across the EU and enhancing the convergence of supervisory practices in this area are key objectives of the Commission defined in March 2018. The aim is to promote greater engagement between the competent authorities, financial players and providers of technology with a view to developing the knowledge of the

competent authorities about the opportunities and risks related to technology and clarifying the needs in terms of regulation and supervision.

Proportionality should not come at the expense of market integrity. A proper risk management process will be needed to mitigate risks and protect consumers, because insufficient trust on the consumer side will hinder innovation. Financial services using DLT must respect the same high security standards as existing financial services firms. A responsible balance must be reached between encouraging innovation from new market participants and protecting the safety and soundness of the financial system.

3. Policy approach needed for facilitating the development of DLT solutions

3.1. Avoiding regulatory fragmentation at the EU and global levels

A Central Bank official highlighted the need for both a European and a global approach to blockchain and DLT, which by nature have no jurisdiction. Technical standards in particular should be handled at the global level. There is a tendency to establish national frameworks first, making the harmonisation of regulations at the EU level difficult. As the area of DLT and blockchain is relatively recent, there is an opportunity to set standards on a global level before national jurisdictions have taken their stances. The official thought it would be wise to be proactive and pre-emptive in this regard before everything has been settled by the industry or individual jurisdictions. Defining what needs to be done at the European level is more difficult, as DLT is developing at the international level. As has been seen in the past, some areas where Europe could act as a frontrunner are data protection, governance and the safety and soundness of DLT systems. The role of the EU in relation to DLT and digital tokens could be in balancing the need to foster technological developments with the need to cope with potential risks.

An official agreed that there should be a focus on global solutions. Prior attempts at harmonisation of existing legal rules, particularly in securities, suggest this may be challenging at EU-level.

An industry representative emphasized that avoiding fragmentation and potential conflicts of rules across jurisdictions are a key priority for securities post-trading infrastructures. This is true at the European and also at the global level. When a new technology or service comes onto the market it is understandable that there are some local initiatives at the beginning, which is positive in terms of quickly building a first reference for a new topic. However when the market starts to mature, national or local regulators should let the EU or international regulators manage the process.

Another industry representative considered it critical for regulators to coalesce on the regulation of the DLT space in the EU, observing a spectrum of positions with Malta being fairly ambitious and close to regulating the technology itself and others following more the mainstream position of technological neutrality.

A Central Bank official noted that what is happening in Japan and other regions around the world is almost no different from what is happening in Europe when considering DLT or many other digital developments. The international dimension of these developments requires a tight cross-border connection between regulators about the legal and regulatory regime that applies. With a new technology there is an opportunity to start regulatory thinking from scratch at the global level possibly in conjunction with other micro-level discussions at industry level, where more specific guidelines can be developed

by industry associations. This is however easier to do in the financial sector where this type of process already exists than in other business sectors.

3.2. Standards applicable to the structure and operation of DLT systems

An industry representative was in favour of technological neutrality and avoiding exemptions for new technologies. A question is whether DLT systems can be allowed to develop in regulatory sandboxes that give exemptions to certain rules in order to permit them to grow. Having closer supervision or advice from regulators in sandbox systems is probably helpful for the development of this type of innovation but this should not lead to regulatory exemptions.

Another industry speaker agreed, adding that technology neutrality does not mean that international rules such as the Principles for Financial Market Infrastructures (PFMI) developed by CPMI-IOSCO should not evolve. The PFMI principles were written in 2012 to apply to infrastructures that existed at that point in time. Many questions and issues relating to the development of DLT in financial services concern the operator of the system (i.e. who is setting the platform's rules, who is responsible for privacy, who is liable, etc.). Regardless of how much the system is distributed, the role of the operator of a DLT platform will be critical in the future if DLT takes off.

The speaker added that while regulating technology is not appropriate, regulators should consider how existing business models, structures and roles will change with DLT, and how the financial services regulatory framework may need to change to deal with these evolutions. Otherwise, there is a risk that two sets of rules may emerge: one very strict set of rules applying to traditional market infrastructures, due to their systemic implications; and a different set of rules applying to other systems developing in different parts of the market, but performing some similar activities to traditional market infrastructures. Some operators are connecting counterparties transacting in different systems, but are not handling transactions themselves. However, it would not be appropriate to simply wait and apply the PFMI to operators that have set up permissioned platforms resembling a payment system or another existing type of infrastructure.

Another industry representative urged pragmatism and was not in favour of new rules. The PFMI principles should be used as the cornerstone of the regulation in this area and it should also be possible to assimilate digital tokens to certain categories of securities making existing regulatory concepts still applicable. The representative agreed that regulation should recognise the importance of the role of the third-party operator in guaranteeing the functioning, accountability and reliability of DLT based systems. CSDs are playing a similar role to a certain extent in all settlement systems as operating a settlement between participants. Thought is being given to defining the role that could be played by institutions such as CSDs in the new DLT environment, in terms of how different roles and systems can be combined to the benefit of different business needs, rather than DLT replacing the existing system.

An official explained that standards should depend on whether DLT is permissioned or not. Different types of DLT have different regulatory implications. In a permissioned environment, the existing standards such as the CPMI IOSCO PFMI should remain the relevant standard. Whereas in a permissionless environment there are some issues including those concerning anti money laundering and consumer protection for which an adaptation of standards would be needed. That has already been well documented. In any case, the speaker did not see these latter systems as having much potential going forward and hoped that the 'bubble would burst'.

Appendix:

DLT and blockchain

Definitions and main concepts

(source Cryptocurrencies and Blockchain – European Parliament – July 2018)

DLT is a way of recording and sharing data across multiple data stores (also known as ledgers), which each have the exact same data records and are collectively maintained and controlled by a distributed network of computer servers, which are called nodes.

Blockchain is a particular type or subset of so-called distributed ledger technology (“DLT”). Blockchain is a mechanism that employs an encryption method known as cryptography and uses (a set of) specific mathematical algorithms to create and verify a continuously growing data structure – to which data can only be added and from which existing data cannot be removed – that takes the form of a chain of “transaction blocks”, which functions as a distributed ledger.

In practice, DLT is a technology with many “faces”. It can exhibit different features and covers a wide array of systems that range from being fully open and permissionless, to permissioned:

- In an open, permissionless DLT system, a person can join or leave the network at will, without having to be (pre-)approved by any (central) entity. All that is needed to join the network and add transactions to the ledger is a computer on which the relevant software has been installed. There is no central owner of the network and software, and identical copies of the ledger are distributed to all the nodes in the network. The vast majority of cryptocurrencies currently in circulation are based on permissionless blockchains (e.g. Bitcoin, Bitcoin Cash, Litecoin...).
- In a permissioned DLT system, transaction validators (i.e. nodes) have to be pre-selected by a network administrator or operator (who sets the rules for the ledger) to be able to join the network. This allows them, amongst others, to easily verify the identity of the network participants. However, at the same time it also requires network participants to put trust in a central coordinating entity to select reliable network nodes. In general, permissioned blockchains can be further divided into two subcategories. On the one hand, there are open or public permissioned blockchains, which can be accessed and viewed by anyone, but where only authorised network participants can generate transactions and/or update the state of the ledger. On the other hand, there are closed, private or “enterprise” permissioned blockchains, where access is restricted and where only the network administrator can generate transactions and update the state of the ledger. What is important to note is that just as on an open permissionless blockchain, transactions on an open permissioned blockchain can be validated and executed without the intermediation of a trusted third-party. Some cryptocurrencies, like Ripple and NEO, utilise public permissioned blockchains.

In principle, any node within a DLT / blockchain network can propose the addition of new information to the blockchain. In order to validate whether this addition of information (for example a transaction record) is legitimate, the nodes have to reach some form of agreement. Here a “consensus mechanism” comes into play. In short, a consensus mechanism is a predefined specific (cryptographic) validation method that ensures a correct sequencing of transactions on the blockchain. In the case of cryptocurrencies, such sequencing is required to address the issue of “double-spending” (i.e. the issue that one and the same payment instrument or asset can be transferred

more than once if transfers are not registered and controlled centrally).

A consensus mechanism can be structured in a number of ways. The two best-known in the context of cryptocurrencies are the Proof of Work mechanism (network participants have to solve so-called “cryptographic puzzles” to be allowed to add new “blocks” to the blockchain, which is commonly referred to as “mining”) and the Proof of Stake mechanism (a transaction validator (i.e. a network node) must prove ownership of a certain asset (or in the case of cryptocurrencies, a certain amount of coins) in order to participate in the validation of transactions. This act of validating transactions is called “forging”).

Every user on a blockchain network has a set of two keys. A private key, which is used to create a digital signature for a transaction, and a public key, which is known to everyone on the network. A public key has two uses: 1) it serves as an address on the blockchain network; and 2) it is used to verify a digital signature/validate the identity of the sender.

A user’s public and private keys are kept in a digital wallet or e-wallet. Such a wallet can be stored or saved online and/or offline. ●