



**The Future of
Derivatives Markets:**
A Roadmap for
Innovation



CONTENTS

Introduction 03

Prioritizing Investment 05

Use of DLT in Trade Reporting 08

Use of Digital Assets in Collateral Management 14

Conclusion 20

Appendix 1: High-level Implementation Roadmaps 21

Appendix 2: List of Contributors 22



INTRODUCTION

“It’s now time to take a technology-first approach to this challenge, and we have a plan to put that into action”

Scott O’Malia, Chief Executive Officer, ISDA ¹

The ISDA Future Leaders in Derivatives (IFLD) are excited about the promise of innovative new technology and its potential to transform financial markets. This paper encourages current leaders to embrace transformational change and supports them in adopting an ambitious strategy for defining a digital future for financial markets, fostering an environment for technological innovation, and building a safer, more robust global financial system.

The purpose of this paper is to provide a roadmap for participants in the derivatives industry who are working to implement new technology solutions and applications aimed at optimizing and digitizing financial markets over the next decade. The recommendations set out in this paper are intended to empower current and future leaders to take proactive steps in developing tangible use cases, resolving challenges associated with these use cases and delivering on the promise of innovative and transformational new technology.

The Group-of-20 financial regulatory reforms introduced after the financial crisis have fundamentally changed the traditional operating structure of the derivatives market. These sweeping reforms included a series of measures aimed at increasing transparency and enhancing supervisory oversight of the market. For example, transaction reporting requirements were introduced to provide regulators with real-time transaction data. Central clearing of certain products was introduced to decrease interconnectedness among market participants, reducing the cascading effects of a large institution’s default, with additional collateral requirements applied to the non-cleared segment of the market.

The net effect of these new requirements has been profound and has impacted virtually every market segment and activity within the derivatives market. Firms have implemented new regulations at pace, layering complex new technologies on top of an antiquated infrastructure that is struggling to meet the new demands placed upon it. The creation of vast amounts of data to support compliance with many disparate and duplicative reporting requirements has resulted in data quality and consistency issues. The proliferation of paper-based contracts underpinning each of these new processes continues to cause issues for firms seeking to digitize and automate the contract generation and management process.

The next decade will be similarly transformational. The increasing maturity of distributed ledger technology (DLT) is likely to lead to widespread implementation across financial markets, and as such, could provide common, consistent data representation and allow for real-time regulatory oversight of the market. The deployment of autonomous self-executing code or smart contracts built upon the data will allow for greater automation of systems and processes. The use of digital or tokenized assets and the potential introduction of central bank digital currencies (CBDCs) in certain jurisdictions will transform the way existing financial markets operate through the introduction of real-time or intra-day settlements, lower transaction and maintenance costs and the promotion of greater and more cost-efficient access to financial products and, particularly when used in conjunction with smart contracts, greater automation of the front-to-end trade lifecycle.

¹ Time to Digitize Trade Reporting, Scott O’Malia, February 17, 2021, www.isda.org/2021/02/17/time-to-digitize-trade-reporting

There is, however, a large degree of hype associated with these technologies. It is important to acknowledge that the use of blockchain, digital assets and artificial intelligence cannot solve every problem effectively or efficiently. This leads to an important question: where should the market invest its time and energy in exploring these opportunities? This paper seeks to answer that question.

The paper begins by considering the maturity of the relevant technologies and proposes metrics for determining which solutions should be prioritized. Based on these metrics, it identifies two compelling use cases:

- a) the use of DLT to simplify, standardize and automate the regulatory reporting process; and
- b) the implementation of digital assets within collateral management systems to lower settlement times and reduce risk.

The paper elaborates on the current state of trade reporting and collateral management and identifies relevant issues and pain points that could be resolved using a particular technology solution. It then sets out a roadmap to explain how the benefits of technology can be achieved. A high-level summary of this roadmap is set out in Appendix 1.

While the intention of this paper is not to specify or recommend any particular approach, or to address any specific technological application or project, it does suggest steps that should be taken to design implementation programs, and also highlights areas where further industry collaboration will be required to identify and resolve existing areas of uncertainty.

PRIORITIZING INVESTMENT

Executives and other senior stakeholders within financial markets face a number of challenging issues, all vying for their attention and resources. These senior decision-makers are also inundated with proposals for how new technology solutions can resolve or alleviate some of these issues. To realize the potential of technology, it is crucial that the industry prioritizes effectively and allocates resources efficiently to ensure tangible achievements are delivered.

The IFLD developed the following metrics to assist firms in prioritization and effective allocation of resources:

1. ASSESSING THE CHALLENGES AND OPPORTUNITIES

The process begins by assessing the importance or urgency of the challenge or opportunity, as well as the primary drivers behind it. It then allocates each challenge with a weighting based on these criteria.

Challenge / Opportunity	Description	Urgency Weighting ²
Regulatory Mandates/ Compliance	Many operational processes within financial markets have been implemented to facilitate compliance with applicable regulation. Firms are required to implement these processes or risk enforcement actions, including significant fines or sanctions, from regulators.	5 Processes, infrastructure, and technology designed to achieve or facilitate compliance with applicable regulation are vital in ensuring firms can comply with regulations and continue to operate within regulated financial markets.
Commercial Opportunities	Optimization of operational processes or implementation of new technology can result in the creation of new opportunities within existing markets, or even the creation of new markets. This can lead to increased revenue opportunities within existing business lines or the creation of new revenue streams.	4 System and process enhancements that can lead to immediate or near-term revenue growth or commercial opportunities will typically be a significant driver toward optimization.
Efficiency Savings	Many existing operational processes within financial markets are inefficient. This may result in persistently high operational and maintenance costs.	3 While the benefits of optimizing legacy systems are self-evident, the level of initial investment and the lack of immediate costs savings can often be an impediment to optimization.
Continuation of Current Operations	Many processes and investments require ongoing maintenance and investment to ensure continuing operation, as adoption of new technologies will be gradual.	1 Maintaining existing systems is important to ensure continuity of service, especially for stakeholders that are slower to adopt new technology. However, it may compound existing inefficiencies, further embed complexity and redundancy, and make it more challenging to optimize in the future.

² A weighting of five indicates that the opportunity or challenge is very important and very urgent. A lower weighting indicates that the challenge or opportunity is less important or urgent

2. ASSESSING TECHNOLOGICAL MATURITY

Next, the maturity of the various available technology solutions is assessed, as well as the likelihood of successful implementation within financial markets in the near future.

Technology	Description	Maturity Weighting ³
Digital Assets	A digital asset is a digital representation of value or contractual rights that can be transferred, stored, or traded electronically, and which may (though does not necessarily) utilize cryptography, DLT or similar technology. This includes cryptocurrencies, stablecoins, security tokens and utility tokens.	4 The use of digital assets within financial markets has increased considerably over the past few years. The crypto-asset market is now estimated to be worth roughly \$3 trillion and is attracting interest from institutional investors. Digital assets are also benefitting from increased legal and regulatory certainty in many jurisdictions.
DLT/Blockchain	DLT or blockchain platforms allow multiple users or participants to enter transactions into a shared, distributed, append-only, immutable databases and guarantee that all nodes on the network are synchronized on the state of each record. These systems are often used to facilitate digital assets, smart contracts, and/or for its data synchronization features.	3.5 As the technology underpinning many forms of digital asset, DLT/blockchain acts as a vital enabler of further digital asset adoption. While it has been argued that DLT has struggled to achieve critical mass adoption, it is clear that this technology has many potential applications across financial markets, particularly in areas that may benefit from standardized, common representations of financial or other data.
Smart Legal Contracts	Smart legal contracts are contracts that seek to facilitate the autonomous execution of obligations within the contract. There are several potential models, some of which require narrative text within a standard contract to be translated into machine-readable, executable code.	3 Smart legal contracts are attracting increasing attention, particularly within the legal community, and have the potential to support greater automation within financial markets. However, there are a number of complex legal and technological issues associated with their use, which mean they have yet to achieve widespread adoption.
Artificial Intelligence/ Machine Learning	Artificial intelligence (AI) is a broad discipline within computer science concerned with building smart machines capable of performing tasks that typically require human intelligence. Machine learning is a branch of AI that focuses on the use of data and algorithms to imitate the way humans learn, gradually improving its accuracy.	3 AI has a long history, with much of its early research beginning in the mid-20th century. Within financial markets, AI and machine learning have been deployed in several areas, including documentation review and financial analysis. The lack of standardization and structure within many of these data sets, particularly legal agreements, has so far limited the use of AI to relatively discrete tasks.

³ A weighting of five indicates the technology is very mature and used widely used across many applications within financial markets. A lower weighting indicates the technology is more nascent or less widely used

3. ASSESSING POTENTIAL USE CASES

Finally, a number of potential use cases are identified that involve the application of new technology solutions across the trade lifecycle. These use cases are assessed and the above-mentioned weightings are applied to determine priority.

Use Case	Objective	Potential Solution	Aggregate Weighting ⁴
Pre-trade			
Documentation Negotiation	Significantly reduce human interaction in negotiations.	Using AI and machine learning to automate the documentation negotiation and generation process, creating the foundation for smart legal contracts.	Urgency weighting: 3 Maturity weighting: 2.5 Total: 5.5
XVA Computation	Simplify existing complex processes for computing trade pricing.	Using AI and machine-learning tools to substitute the mark-to-market Monte Carlo simulation process, allowing the reduction of the pricing timing.	Urgency weighting: 3 Maturity weighting: 3 Total: 6
Post-trade			
Trade Processing	Eliminate data discrepancies between counterparties by creating a method to share data and processes more effectively.	Establish authoritative data stores (ADS) that process data in a transparent, standard way using DLT.	Urgency weighting: 4 Maturity weighting: 3.5 Total: 7.5
Collateral Exchange and Settlement	Create ability to move assets instantly and enhance transparency into collateral lineage.	Tokenization of assets and cash using digital assets and associated technology.	Urgency weighting: 5 Maturity weighting: 4 Total: 9
Trade Reporting	Provide regulators with high-quality data in an efficient, accurate and transparent manner and enable the industry to be more flexible to adapt to regulatory change.	Standardize economic terms, establish digital industry-standard transparency rules, and increase transparency by adopting DLT-based reporting platforms and solutions.	Urgency weighting: 5 Maturity weighting: 3.5 Total: 8.5

4. OUTCOME

On the basis of the above metrics, this paper focuses on two use cases:

- a) the use of DLT to simplify, standardize and automate the regulatory reporting process; and
- b) the implementation of digital assets within collateral management systems to lower settlement times and reduce risk.

⁴ Aggregate weighting is determined by adding the urgency weighting to the maturity weighting. Where more than one technology application is proposed, the average of each of their respective maturity weightings is used

USE OF DLT IN TRADE REPORTING

This section of the paper will discuss the key challenges the industry faces in relation to trade reporting and will then identify the potential benefits associated with the use of DLT in trade reporting. It will then provide a roadmap setting out how the industry can achieve these benefits.

1. CURRENT CHALLENGES

Transaction reporting was introduced to improve regulatory and market transparency, mitigate systemic risk, and protect against market abuse.

Achieving these objectives requires:

- (i) detailed and accurate specification of reporting requirements that are harmonized across various jurisdictions' reporting regimes;
- (ii) complete, timely and accurate reporting by counterparties to trade repositories; and
- (iii) trade repositories granting access to complete and accurate data to the relevant authorities.

The IFLD has identified three main challenges market participants currently face.

a) Lack of Data Quality

Data quality is a measure of the condition of data based on factors such as accuracy, completeness, consistency, reliability and whether such data is up to date. While industry stakeholders (ie, counterparties, trade repositories and regulators) have made significant progress, data quality issues continue to arise.

One of the main issues affecting data quality is the non-reporting or erroneous reporting of derivatives trade data⁵. The European Securities and Markets Authority (ESMA) has estimated that there are approximately 3.2 to 3.7 million open non-reported trades on any given reference date. If non-reporting of associated lifecycle events were to be counted also, the number of non-reported submissions would likely be significantly higher. There are several reasons for non-reporting or erroneous reporting, including jurisdictional differences in the definition of reportable transactions and data fields, over-reporting by counterparties⁶, and inadvertent or deliberate non-compliance.

⁵ The Commodity Futures Trading Commission (CFTC) has re-written its reporting rules to include new error correction and verification requirements to address data quality concerns

⁶ The European Securities and Markets Authority (ESMA) has reported that data inflation was an impediment to high-quality data. In particular, ESMA observed there was an inflation in the number of outstanding contracts during the summer of 2020. This was caused by a single reporting counterparty that was not reporting in line with European Market Infrastructure Regulation (EMIR) requirements. The issue was finally resolved in late September 2020. This example highlights the importance of counterparties reporting in line with regulatory expectations. Misreporting by one counterparty could undermine the data regulators' use to conduct analysis and assess financial and economic risk. ESMA also observed there was a steady increase of reports received late. See EMIR and Securities Financing Transactions Regulation (SFTR) data quality report 2020, ESMA, www.esma.europa.eu/sites/default/files/library/esma80-193-1713_emir_and_sftr_data_quality_report.pdf

Under the European Market Infrastructure Regulation (EMIR), dual-sided reporting requirements require regular data reconciliation. In general, the reconciliation process is split into two separate phases: pairing and matching. Broadly, a derivative is considered successfully paired when the trade repository is able to identify both legs of the reported derivative based on the unique key (ie, reporting counterparty identification, identification of the other counterparty, and trade identification). ESMA has observed that while pairing of transactions reported under EMIR has increased from approximately 40% to 53%, the rate is still very low considering that successful pairing requires counterparty agreement on three fields only⁷. ESMA has noted that, among other things, the lack of agreement between counterparties on key reportable data fields is a barrier to successful reconciliation.

b) Lack of Regulatory Harmonization

Given the interconnectivity of market participants globally and the cross-border nature of transactions, many counterparties are subject to multiple reporting regimes and each jurisdiction has different reporting requirements (for example, the kinds of reportable transactions and data fields). This fragmented approach results in data sets being collected by different trade repositories across jurisdictions, which does not provide a global view of risk, despite the cross-border nature of the derivatives markets.

c) No Golden Source

A golden source of trade data for regulatory reporting is critical for efficient and accurate reporting. While most industry participants that are major players in the derivatives market, such as leading international financial institutions, have come a long way from manual processes to a semi-automated process by coding the extraction of trade data from various sources, there is still no one key source from which trade data is available to market participants. Further, smaller corporates that do not have the expertise or the budget may still be reliant on manual processes to extract data to comply with their trade reporting obligations.

2. TECHNOLOGICAL BENEFITS

The adoption of DLT-based regulatory reporting solutions will significantly improve the regulatory reporting process and associated outcomes by providing regulators with the real-time data that is necessary to identify and analyze risks in the financial system. This section details the potential benefits of using DLT on top of the Common Domain Model (CDM) and Digital Regulatory Reporting (DRR) to enhance derivatives trade reporting.

a) Benefits to Market Participants

- **Data quality and golden source.** DLT could improve data quality by facilitating the establishment of golden sources of data that are shared between each party that is permitted to access that data. DLT allows for multiple parties to ensure that their internal trade databases are synchronized with each other, which can serve as a key driver for allowing counterparties to agree on a golden source or authoritative data store for their transaction data. For reporting, a party can permission a regulator to access its trade repository and have a cryptographic guarantee that the regulator has the exact same trade data in its system.

⁷ EMIR and SFTR data quality report 2020, ESMA, www.esma.europa.eu/sites/default/files/library/esma80-193-1713_emir_and_sftr_data_quality_report.pdf

- **Robust inter-entity matching.** In some jurisdictions, the current reporting obligation requires that all contractual parties individually submit and reconcile their trade data and reports using multiple datasets for the same transaction. With DLT, reports could be generated automatically after receipt of transaction confirmation, and a single common dataset could be shared on the ledger with the respective counterparties. In this way, a single DLT record could eliminate manually intensive procedures, as well as the need for duplicative reconciliation processes. This would avoid any mismatching of records and ease the operational burden on market participants⁸.
- **Standardized data models and data logic.** The use of DLT will promote standardized data models and data logic, which would reduce cost and complexity. Revisions to existing regulatory reporting requirements, or new reporting requirements, could be easily added to the standardized reporting model, making it easier for market participants to adopt new requirements in a consistent and efficient way.
- **More efficient and effective implementation of rules.** Trade reporting regimes are usually implemented in phases (for example, depending on counterparty type and type of derivatives) and are subject to rule changes. Depending on the design of the DLT, governance mechanisms could be built into the DLT so that the trade validation rules can be modified according to new regulatory requirements. As such, the use of DLT could facilitate these rule changes and ease the administrative and operational burden of market participants having to update their data reporting messages.
- **Multi-jurisdictional compliance.** Financial institutions and corporates that operate globally are typically subject to more than one jurisdiction's trade reporting rules. While there are differences across each jurisdiction's rules, there will often be overlap in terms of the reportable economic terms. The standardization of the economic terms that are recorded on DLT and the onboarding of multiple regulators in different jurisdictions would significantly ease the operational burden of trade reporting and reduce the duplication of reporting a similar set of data to different regulators, reducing the costs of multi-jurisdictional compliance. The use of DLT, which brings about efficiency, accuracy, and transparency, provides the tools to facilitate effective substituted compliance across jurisdictions.
- **Use for new technologies.** A DLT solution could serve as the base layer for advanced technologies utilizing the data it collects. The organized, high-quality data that would be collected can be used for the application of big data solutions and analyses with AI.

b) Benefits to Regulators

- **More robust regulatory supervision.** The adoption of a DLT-based regulatory reporting system with a completely standardized data model that fulfils regulatory objectives could also help to improve the efficiency of micro- and macro-prudential supervision, while simultaneously lowering implementation costs⁹.

⁸ DLT could also provide greater efficiency in complying with the one-sided verification requirements

⁹ The CFTC has suggested DLT could provide operational efficiencies by enabling faster, cheaper, and more reliable access to swap trade data, which could also revolutionize the traditional ways in which regulatory authorities work. In fact, the CFTC seeks to collaborate with other authorities to cultivate the development of 'regulator nodes' on the distributed ledger, www.cftc.gov/sites/default/files/2018-04/oce_chairman_swapregversion2whitepaper_042618.pdf

- **Live data availability.** In the case where a regulator adopts a DLT node, once a transaction is confirmed, the regulator’s data repository can instantly include a synchronized copy of the trade details, providing regulators with real-time access to ledgers and reporting content¹⁰. This will increase the efficiency of supervision and transparency. This may also allow regulators to quickly identify and react to undesired market patterns.
- **Data quality.** The DLT environment generates a single source of truth so that all permissioned participants have the same information about transactions recorded on the ledger. If regulators across several jurisdictions streamline the requirements on the data sets to be reported and recorded on the ledger, the DLT-based trade reporting system with standardized data could eliminate the need for regulators to transform and match the data recorded on the ledger to comply with differing legal definitions in different jurisdictions¹¹.
- **Multi-jurisdictional oversight.** This will allow the regulator in each country that receives the data from the ledger to have multi-jurisdictional oversight and to be able to focus on conducting meaningful analysis drawn from the DLT rather than spending time sharing and comparing the data from each individual data system in each jurisdiction. The use of DLT could also increase the cross border efficiency of interaction between regulators and promote standardization of trade reporting regulations.

3. IMPLEMENTATION ROADMAP

A core component of being able to use DLT for regulatory reporting is the establishment of DLT-based trade data networks. Using these networks as the foundation, regulatory reporting solutions can then be built on top.

There are a few requirements and steps needed for these types of networks that will set the industry up for success in delivering on the described benefits for transaction reporting. Steps (a) to (c) of the roadmap consider the technology-driven requirements and steps (d) to (e) explore the macroeconomic considerations that would support successful implementation.

a) Develop DLT-based Trade Data Network as Authoritative Data Store

Market participants should adopt the DLT-based trade data network as an authoritative data store.

Reporting systems today operate separately and apart from the critical internal risk and operational systems that manage derivative trades. As a result, there is an increased risk that data between these two systems may differ, which can be a major problem when the data in risk systems are scrutinized much more than those in reporting systems. By using DLT, we can ensure data that is processed in these various systems can remain in synchronization with each other. For the industry to ensure that the data it reports on is the most accurate, the source of that data should ideally be a shared ledger that serves as the source of truth for not only reporting but also critical internal functions such as risk, payments, collateral management, and accounting. The ledger must also serve as a shared source of truth for every counterparty involved.

¹⁰ Trade repositories could function as nodes on the DLT that can verify transactions on the DLT, and regulators could function as specialized participants on the DLT having direct access to the data and underlying transaction network, so that they could observe trading levels or receive automated regulatory reports

¹¹ The CFTC and ESMA have revised their reporting requirements with global technical standards, and authorities in Singapore, Australia, and Hong Kong have proposed rule changes in support of adopting the global technical standards

Mechanically, this system would need to be at least the golden source for trade confirmations, where the trade confirmation is the legally binding contract whose economic terms are represented digitally. Generating these confirmations on a distributed ledger could be done either by integrating with existing trade confirmation systems or by building new trade confirmation systems (ie, matching and affirmation) on top of a distributed ledger.

Furthermore, platforms such as swap execution facilities (SEFs) can also feed into the DLT-based data network directly, given that trades executed on-SEF are regarded as confirmed. These critical sources of truth are known as authoritative data stores (ADS). The use of DLT with an ADS serves as a mechanism to distribute truth to all permissioned parties and systems. In addition to serving as a critical requirement for solving the regulatory reporting problem, the use of a common, standardized ledger for storing, processing, and distributing trade data would significantly reduce operational costs, while enhancing risk management and trade processing capabilities. This would strengthen the operational resilience of both market participants and market infrastructures.

b) Adopt a Common Standard

Market participants should continue working closely with trade associations such as ISDA to develop common technology standards.

To harness DLT and other technologies to advance derivatives reporting, standards must be in place for data models, processing formats and reporting. The CDM performs much of this by standardizing how post-trade events are processed and represented in code.

Furthermore, ISDA's DRR initiative enables firms to interpret and implement regulatory reporting rules consistently via common, machine-readable code. The DRR uses the CDM as the core data model and so any CDM-based trade repository can use the code from this initiative to assist with regulatory reporting. One of the goals of the DRR is to support the Commodity Futures Trading Commission's changes in regulatory reporting rules by December 2022.

Regardless of whether DLT is adopted for derivatives trade reporting or not, both the standardization and common data taxonomy introduced by the CDM are still essential to overcome many of the challenges mentioned in this paper.

c) Interoperate With Legacy Systems

Market participants and technology developers should ensure DLT-based networks can integrate with legacy systems.

As with any new technology that is implemented, to encourage the maximum level of adoption, the solution provider needs to make it easy to integrate with. This includes being able to accept and send existing message formats (eg, FpML, FIX), as well as other tools that allow firms to gradually adopt DLT at their own pace.

d) Regulatory Amendments to Recognize Data on DLT

Market participants should engage with regulators to achieve recognition and facilitate the use of DLT in transaction reporting.

If a regulator can either operate its own DLT node or outsource this as a service, it can gain a number of the inherent benefits of DLT, including having a guarantee that the data the regulator receives is an exact replica of the data stored within each firm's system. However, derivatives trade data available on DLT platforms could be used to satisfy derivatives trade reporting regulations only if current frameworks are periodically modified to accept or meet new objectives. Market participants and regulators should work together to adapt trade repositories and other relevant infrastructure to facilitate the use of DLT. In this respect, it would be helpful if national authorities and regulators could introduce regulation that recognizes the use of DLT for market participants' compliance with transaction reporting obligations.

e) Consider Application to Other Product Types

Market participants should consider expanding common standards in derivatives markets to other financial products.

The use of DLT in derivatives trade reporting should also be expanded to other products such as repurchase agreements and securities lending agreements as regulators work to establish reporting obligations on such products. This would ensure consistency across products, promoting greater interoperability among similar solutions. ISDA, the International Securities Lending Association (ISLA) and the International Capital Market Association (ICMA) are collaborating on expanding the CDM to these products, which is a welcome development.

USE OF DIGITAL ASSETS IN COLLATERAL MANAGEMENT

The current collateral management model requires significant resources to service properly. For example, resources must be devoted to processing and verifying margin calls, processing instructions and notices to and from custodians, as well as maintaining and reconciling the various records involved. Recalling and substituting collateral assets also presents considerable operational challenges and can impact capital and liquidity ratios. These are precisely the type of labor-intensive processes that blockchain technology can help to alleviate.

This section of the paper will discuss how blockchain technology can be leveraged to streamline collateral management practices. It will first explore the key challenges the industry faces in relation to collateral settlement. It will then identify the potential benefits associated with the implementation of digital assets within collateral management systems to lower settlement times and reduce risk. Finally, it will present a roadmap for how this use case can be delivered.

1. CURRENT CHALLENGES

As recent advances in technology continue to transform certain aspects of financial markets, collateral management has seemingly continued to operate unaffected. The process of moving collateral between counterparties today looks much like it did years ago. It still entails a series of relatively manual operations involving various notices and instructions circulating between a host of parties, each with their own internal records to update and maintain.

a) Lack of Collateral Optimization

In October 2020, ISDA published the *ISDA Collateral Management Transformation Toolkit: Collateral Settlement Automation*, which provides resources to help ISDA members achieve transformation in collateral management¹². In that whitepaper, based on input from ISDA members gathered through member outreach and a collateral management transformation survey, ISDA identified several pain points and challenges around collateral settlement, noting that it is “a time-consuming, resource-intensive, and capital and liquidity burdensome process”. While the paper focused on the automation of many manual processes around the transfer of collateral (eg, sending, affirming margin, and managing margin calls, sending settlement instructions and confirming settlement status), some of those challenges are also applicable to the transfer of collateral itself.

b) Regulatory Initial Margin

Phase six – the final phase – of the uncleared margin rules (UMR) across multiple jurisdictions is anticipated to bring an estimated 775 more entities into scope of the regulatory initial margin (IM) requirements from September 1, 2022¹³. This is more entities than any other phase and more than double the number that was brought into scope by phase five, which impacted more than 300 firms. This will introduce exponentially greater challenges than any other phase, due to the increased number of in-scope entities, additional custodian onboarding and know-your-customer requirements, and higher demand for high-quality collateral. Phase-six entities are also much less likely to have implemented automated collateral management processes. While ISDA has developed documentation solutions such as ISDA Create to facilitate the negotiation and execution of collateral relationships, the scale of the effort required for phase six should not be underestimated.

¹² Collateral Management Transformation Toolkit: Collateral Settlement Automation, ISDA, October 5, 2020, www.isda.org/2020/10/05/collateral-management-transformation-toolkit-collateral-settlement-automation/

¹³ Countdown to Phase 6 Initial Margin, ISDA, www.isda.org/countdown-to-phase-6-initial-margin/

c) Timely Transfer of Collateral

The transfer of collateral across multiple counterparties to meet margin calls is very time-consuming. Without complications, the entire collateral management process can generally take up to two business days depending on when the demand was first issued and the jurisdiction applicable to the transaction¹⁴. Additionally, it is not uncommon for administrative errors and/or disputes to push the settlement timing even further out. With the implementation of the UMR in multiple jurisdictions, there is an increase in the volume and frequency of collateral transfers, both in terms of IM and variation margin¹⁵. The increase in volume and the shorter timeframe for collateral transfers and settlement place greater burdens on already resource-constrained collateral management functions, which could result in greater risks of non-compliance with regulatory or contractual requirements.

d) Fragmented Collateral Management Systems

Many firms grow by way of mergers and acquisitions, and the collateral management systems of both the target and acquiring firms are not always fully integrated, or collateral management systems might be old with a complex patchwork of fragmented systems. Due to institutional siloes and different risk management approaches, firms may also be maintaining different collateral management systems for different products. This leads to inefficiencies in the collateral settlement process that could be mitigated through optimization of the collateral management processes, including the use of an industry-wide solution for the settlement of digital assets as collateral.

e) Rehypothecation and Collateral Identification

In the current framework of non-regulatory margin, once collateral is posted or transferred and the secured party or collateral receiver has a right of rehypothecation or use, there may be no record of how this collateral is used or further transferred for the holder's own purposes. Where collateral is transferred by way of security interest, the pledgor still has an ownership interest in the underlying collateral, but collateral traceability and the ability to get back the specific collateral posted is not market practice. Furthermore, this lack of transparency limits the ability of regulators to accurately measure the stability of the financial system as a whole, which has been a concern for many years.

2. TECHNOLOGICAL BENEFITS

As mentioned above, blockchains allow for digital assets to be transferred near instantly, efficiently and with a clear lineage of ownership. This technology can be a powerful tool for any type of collateral that is commonly used for derivatives. The specific benefits are explored below.

a) Instantaneous Transfers

Using a distributed ledger can allow for collateral to be transferred instantly and intraday, which can allow for significant risk reduction and a streamlined transfer process. This is done by consolidating a lot of the various parties, systems and databases that are traditionally used for settlement into one distributed platform. As a result, many of the reconciliation processes that are often carried out between parties and systems are made redundant with this technology. This saves time and cost while also mitigating risk. Additionally, the mechanism to transfer collateral is standardized across each type of asset. For example, the settlement of a tokenized treasury can operate exactly the same as cash (stablecoins) settlement.

¹⁴ Beyond margin, there are other types of collateralized products (eg, securities lending) that also require greater efficiency

¹⁵ The timing for delivering collateral is shorter for counterparties that are subject to a UMR (generally described as same-day transfers) as compared to the small segment of the market that is not subject to any UMR but might be exchanging margin based on a firm's risk assessment. In a single business day, a given market participant can have multiple collateral settlements running through different stages across a host of counterparties

b) Diversity of Offerings

There are generally four different types of blockchain-enabled assets that could be used for collateral:

- **Tokenized assets:** The asset itself is managed by a central party, but it is represented on a blockchain ledger. An example could be a treasury note where the treasury note itself can be held at a bank, but that bank can create a representation of that note on the ledger. The underlying asset can essentially be anything including stocks, bonds, commodities, real estate, art, or any other asset type. In order to tokenize an asset that exists off-chain, there would need to be a custodian (that holds that asset), a manager (that manages the inflows, outflows, and asset makeup), a party to bridge this representation on chain, and a blockchain network.
- **Stablecoins:** This is similar to a tokenized asset except that it is linked to currencies, typically fiat currencies. An example is where a bank may hold US dollar cash within an account, but then represents that cash as a token on a blockchain. While the US dollar stablecoin is the most popular today, this market should also expand over time into many other fiat currencies.
- **CBDCs:** This is a natively digital currency issued by a central bank.
- **Natively digital asset:** An asset that is issued on a blockchain from inception. The best example is Bitcoin. There may be other more traditional types of asset that are issued as natively digital assets in future, such as stocks or bonds.

c) Transparency

Digitized collateral can allow for complete transparency in collateral ownership and lineage of collateral transfers. Blockchains indicate which entity owns each digital asset and, as such, only that entity is authorized to transfer that asset from one party to the next. Furthermore, blockchains also indicate the chain of ownership from one entity to another, all the way back to issuance.

In the context of collateral that may be rehypothecated, this provides parties with visibility into when collateral is rehypothecated and potentially re-pledged as collateral into other contracts. Without visibility into whether collateral pledged has been rehypothecated, there is a limit to each market participant's ability to fully assess the credit risk of its counterparty. This is also beneficial in a legal structure where collateral is transferred to the collateral taker by way of security interest.

3. IMPLEMENTATION ROADMAP

The underlying technology needed to support digitized collateral is far from theoretical. The US dollar stablecoins market is currently over \$175 billion, the technology to support digital assets has been in production since Bitcoin first came online in 2009, and there are many applications that currently use digital assets as collateral in the more retail-focused decentralized finance markets. The missing piece here is expanding the list of eligible assets and bridging together this technology with institutions' existing collateral management processes. For market participants, there is both technical and non-technical work that needs to be done and certain legal assessments too.

a) Development and Use of DLT to Transfer Digital Assets

Market participants and technology developers should collaborate closely to develop DLT platforms that can accommodate legally robust and regulatory compliant digital asset-based collateral.

As discussed above, virtually all forms of digital asset that exist today could be transferred from one counterparty to another using DLT-based solutions, which along with the tokenization of collateral, could streamline collateral settlement and mobilization and offer improved data transparency for counterparty risk management and collateral optimization.

The specific technological structure of any network used for collateral should be considered, having regard for issues such as operational efficiency, security, and regulatory compliance. This will support the industry in gravitating toward an acceptable standard to ensure that these applications are well positioned to become a staple technology component of the derivatives collateral transfer ecosystem, much like the critical role the SWIFT messaging system plays in the global payment markets today.

The specific DLT network or networks will be influenced by the nature of the collateral as this could impact the manner in which transfer is achieved through the specific network (eg, through claims on collateral entitlements or physical movement). In ISDA's *Legal Guidelines for Smart Derivatives Contracts: Collateral*, ISDA explains that in the context of collateral management, a system designed as a 'light chain' would not house any collateral, whereas a system designed as a 'heavy chain' could house tokenized collateral assets that are native to the ledger and could support the transfer of such assets between parties¹⁶.

b) Broad Industry Adoption of DLT to Support Transfer of Digital Assets

All segments of the derivatives market (eg, sell side, buy side and custodians) should migrate to and adopt DLT-based solutions to effect and facilitate the transfer of digital assets as collateral.

The development and use of DLT solutions for collateral transfer and settlement must be industry-wide (including sell side, buy side and custodians). The key to successful implementation is to have the greatest number of market participants using the DLT solution on a single network or multiple networks (which, ideally, are interoperable).

Market participants will also need to assess how their existing systems could interact with and/or be replaced by this new technology. While many reconciliation processes are removed, there may be unexpected new scenarios that require 'break glass' procedures on this new technology and workflow. Integration will generally be a key technical challenge, which also provides opportunities for market participants and vendors to build integration solutions that can be offered as a service. Additionally, there are new technology risks that need to be addressed, such as private key management and data privacy.

Because collateral involves multiple parties, any migration effort also requires careful industry-wide coordination so as to have alignment on treatment of digital assets as collateral, new operational workflows, and standards.

The IFLD believes it may be worthwhile for market participants to conduct small pilot programs that integrate digital assets within existing operational systems to better assess the impact, benefits, and costs.

¹⁶ Legal Guidelines for Smart Derivatives Contracts: Collateral, ISDA, September 2019, www.isda.org/a/VTKTE/Legal-Guidelines-for-Smart-Derivatives-Contracts-Collateral.pdf

c) Digitization and Adaptation of ISDA Collateral Documentation

The industry should digitize and adapt collateral documentation as necessary to accommodate the transfer of digital assets as collateral.

ISDA has published industry standard templates allowing market participants to carry out collateral settlement for non-regulatory margin or independent amount, regulatory variation margin, or regulatory IM using two main types of assets: cash and securities. ISDA is currently working to digitize these documents, deliver them to the market through ISDA Create¹⁷, leveraging the ISDA Clause Library¹⁸, and develop standardized operational representations of their terms within the CDM. This is a welcome development and will provide a robust foundation for greater digitization and automation of collateral processes.

The global market should also form a view on whether tokenized representations of cash (ie, a stablecoin) and securities are any different from an asset transferred via traditional means, and whether this requires amendments to existing credit support documentation or if it should be treated as simply using different technology to transfer the asset.

There are a number of contractual issues that will need to be considered. ISDA's *Contractual Standards for Digital Asset Derivatives* whitepaper noted that the transfer mechanics set out in ISDA's collateral documentation generally apply to cash and securities and may not be well suited to transfers of digital assets¹⁹. ISDA noted that if a specific type of digital asset serving as underlying collateral is neither cash nor securities, the transfer mechanics would not properly address the specificities of such an asset. As another example, ISDA noted that parties may be required to transfer cash, securities or other property as 'distributions', but it is unclear whether this requirement applies to digital assets.

d) Legal Effectiveness

Market participants should engage with legal standard-setting bodies and national authorities' work to develop harmonized legal frameworks that acknowledge digital assets as forms of property, which are capable of being the subject of security arrangements.

Digital assets have different characteristics and are still maturing in their development, evolution, prevalence and use as collateral in the derivatives market, and different types of assets could be classified differently. Today, the legal classification of digital assets varies between jurisdictions²⁰. The global derivatives market would benefit from a greater degree of consistency and predictability through harmonization across (and even within) jurisdictions. To this end, it would be beneficial for the industry to collaborate with international standard-setting bodies (eg, UNIDROIT²¹) to develop global standards and principles for the classification of digital assets.

¹⁷ ISDA Create is an online platform that allows users to produce, deliver, negotiate and execute derivatives documentation completely online, www.isdacreate.org

¹⁸ The ISDA Clause Library is a tool that provides users with standard-form drafting options for commonly negotiated provisions within the ISDA Master Agreement, as well as their most common variants. See ISDA Clause Library – ISDA Master Agreement, www.isda.org/book/isda-clause-library-isda-master-agreement

¹⁹ ISDA, Contractual Standards for Digital Asset Derivatives, December 2021, www.isda.org/a/QVtgE/Contractual-Standards-for-Digital-Asset-Derivatives.pdf

²⁰ An International Monetary Fund policy paper (Fintech: The experience so far) explained that a growing number of jurisdictions are classifying crypto assets according to their characteristics, although these classifications vary across jurisdictions and even within these classifications, many jurisdictions "recognize that these categories are not mutually exclusive, leaving room for hybrid assets". www.imf.org/~media/Files/Publications/PP/2019/PPEA2019024.ashx

²¹ ISDA participates as an observer in the UNIDROIT's Digital Assets and Private Law Project, www.unidroit.org/work-in-progress/digital-assets-and-private-law

This would achieve greater clarity and global consistency in terms of product classification and asset type.

In particular, consideration must be given to the effectiveness of the transfer of title or the creation of security interest, including issues around perfection, where collateral is transferred through DLT. ISDA intends to produce further analysis in this area, focusing on the principal issues that should be considered when providing or receiving collateral in the form of digital assets.

e) Regulatory Alignment

Regulators should work to clarify the regulatory treatment of digital assets, with specific focus on whether they can be classified as eligible collateral and the DLT solution achieves segregation under the relevant UMR.

Where parties are subject to a specific UMR, there are various requirements relating to eligible collateral, valuation percentages and segregation, among other things. Relevant parties (market participants, regulators, legislators) should determine whether certain forms of digital asset constitute eligible collateral permissible under the various UMR requirements and the related haircuts and valuation percentages. For example:

- i) Whether CBDCs or stablecoins are the same as cash;
- ii) Whether a tokenized treasury note (ie, where the treasury note itself is held at a bank, but that bank can then create a representation of that note on the ledger) is considered eligible collateral (eg, a security that is issued by, or unconditionally guaranteed as to the timely payment of principal and interest by, the US Department of the Treasury under the US UMR); and
- iii) Whether natively digital assets such as Bitcoin, while not currently within the types of collateral eligible from a UMR perspective, should be if they prove to be safe and stable and sufficiently high-quality and liquid and the appropriate valuation percentage is assigned to them.

Another consideration is whether the collateral segregation as required under the relevant UMR can be achieved using a DLT platform. Specifically, collateral to cover IM requirements must be held by one or more third party, unaffiliated custodians, and the custodian cannot rehypothecate the collateral, other than limited exceptions for cash collateral and the collateral documentation must be a legal, valid, binding, and enforceable agreement under the laws of all relevant jurisdictions, including in the event of bankruptcy, insolvency, or a similar proceeding. It is possible that the collateral documentation of third-party and tri-party custodians will need to be adapted to align with the transfer mechanics and segregation structure applicable to digital assets using DLT.

f) Application to Other Product Types

Market participants should consider expanding digital asset-based collateral solutions to other products.

The use of digital assets as collateral in derivatives should also be expanded to other products such as repurchase agreements and securities lending agreements as such assets could be purchased, sold, or loaned under such agreements. This would ensure consistency across products, promoting greater interoperability or connectedness among similar solutions. ISDA, ISLA and ICMA are collaborating on collateral and the CDM, which is a welcome development that could be leveraged to facilitate the use of digital assets in a wider range of products and potentially more integrated solutions and optimization.

CONCLUSION

This paper has identified transaction reporting and collateral management as compelling use cases for the deployment of innovative new technologies in the derivatives market. It has highlighted existing pain points and explained how technologies such as DLT and digital assets could help to overcome these by delivering greater efficiencies and cost savings. Finally, it has set out a series of practical steps market participants should take to implement these use cases.

Beyond these practical steps, the IFLD believes the most important step to achieving these benefits will be to embrace cultural change across the industry. Both transaction reporting and collateral management are long-standing requirements. However, they continue to prove very challenging to implement, both for market participants and regulators.

Firms have invested heavily in developing transaction reporting and collateral management infrastructure and may be reluctant to make further investment in optimizing this process. However, the industry is at a critical inflection point. The status quo leads toward incremental change, with firms continuing to make tactical investments in existing technology infrastructure, reacting to specific issues and challenges as and when they arise with a patchwork of bespoke, potentially duplicative, and manually intensive technologies and processes.

Market participants should also expect the unexpected. The technological landscape is constantly evolving and will continue to evolve in the future in ways that are impossible to predict. Regulators are also showing greater interest in these technologies and greater regulatory oversight appears to be forthcoming. In some cases, there may be considerable fragmentation and dislocation for market participants in terms of the regulatory environment to which these technologies are subject.

Delivering transformational change will require industry leaders to be aware of and plan for these possibilities, while fostering an environment for technological innovation. Leaders should seek to empower innovation leads and change agents to break down siloes and lead ambitious, cross-functional optimization programs within their institutions and across the industry to deliver a more digital and automated operational infrastructure. Taking a 'proprietary' approach to investment and development will inhibit progress.

The IFLD participants are ready to contribute to and shape the future of this market and to help deliver a safer, more efficient, digitized derivatives market.

APPENDIX 1

High-level Implementation Roadmaps

A. Use of Distributed Ledger Technology in Transaction Reporting

1. Market participants should adopt the DLT-based trade data network as an authoritative data store.
2. Market participants should continue working closely with trade associations such as ISDA to develop common technology standards.
3. Market participants and technology developers should ensure DLT-based networks can integrate with legacy systems.
4. Market participants should engage with regulators to achieve recognition and facilitate the use of DLT in transaction reporting.
5. Market participants should consider expanding common standards in derivatives markets to other financial products.

B. Use of Digital Assets in Collateral Management

1. Market participants and technology developers should collaborate closely to develop DLT platforms that can accommodate legally robust and regulatory compliant digital asset-based collateral.
2. All segments of the derivatives market (eg, sell side, buy side and custodians) should migrate to and adopt DLT-based solutions to effect and facilitate the transfer of digital assets as collateral.
3. The industry should digitize and adapt collateral documentation as necessary to accommodate the transfer of digital assets as collateral.
4. Market participants should engage with legal standard-setting bodies and national authorities' work to develop harmonized legal frameworks that acknowledge digital assets as forms of property that are capable of being the subject of security arrangements.
5. Regulators should work to clarify the regulatory treatment of digital assets, with specific focus on whether they can be classified as eligible collateral and the DLT solution achieves segregation under the relevant UMR.
6. Market participants should consider expanding digital asset-based collateral solutions to other products.

APPENDIX 2

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DISCLAIMER

The intention of this paper is not to specify or recommend any particular approach or to address any particular technological application or project. This paper does not present an exhaustive explanation of all relevant issues in a particular transaction, technology application or contractual relationship. It does not constitute legal, accounting, regulatory, financial or other professional advice. Parties should therefore consult with their legal advisors and any other advisor they deem appropriate. ISDA assumes no responsibility for any use to which any of its documentation or any definition or provision contained therein may be put.

ABOUT THE IFLD

The ISDA Future Leaders in Derivatives (IFLD) program aims to make a positive impact on the future of the derivatives industry by identifying a diverse group of emerging leaders across the industry. The program has four core objectives: to create an active forum for networking and discussion of industry topics and future industry trends; to increase the demographic, cultural and professional diversity of senior leaders within the financial services sector; to support emerging leaders in developing soft skills and technical expertise; and to develop and produce content on issues of strategic importance to ISDA and its members. For more information on the IFLD program, please contact IFLD@isda.org.

ABOUT ISDA

ABOUT ISDA Since 1985, ISDA has worked to make the global derivatives markets safer and more efficient. Today, ISDA has over 980 member institutions from 78 countries. These members comprise a broad range of derivatives market participants, including corporations, investment managers, government and supranational entities, insurance companies, energy and commodities firms, and international and regional banks. In addition to market participants, members also include key components of the derivatives market infrastructure, such as exchanges, intermediaries, clearing houses and repositories, as well as law firms, accounting firms and other service providers. Information about ISDA and its activities is available on the Association's website: www.isda.org. Follow us on [Twitter](#), [LinkedIn](#), [Facebook](#) and [YouTube](#).