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Blockchain in the Digital Asset Ecosystem

Alisa DiCaprio
Andrew Stakiwicz
Goncalo Lima
Ian Salmon
Jason Rozovsky
Michael Riebling

This is an early look at how DLT is evolving the digital assets ecosystem. It details the ways that the established capital markets infrastructure is changing. This includes everything from the emergence of novel types of digital assets to operational changes. We start with the existing structure of capital markets and how legacy instruments and processes are digitizing. Three stages of the asset lifecycle are covered. We show that both pre-trade issuance and asset servicing have made the greatest gains to date, though custody is somewhat slower owing to the need to adhere to regulatory constraints. The final part of an asset lifecycle—post-trade processing—is where DLT has had somewhat limited inroads. We describe the reasons for this and why we expect it to change in the near future.

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Executive Summary

Capital markets have evolved rapidly over the past five years.[1] The sector now encompasses everything from highly regulated traditional derivatives and securities to unevenly regulated cryptocurrencies. In this paper, we detail the changes happening to the traditional side of capital markets. This focus allows us to explore the potential impact of the evolutionary processes that distributed ledger technology (DLT)[2] has introduced. The specific question we answer is what is happening to the traditional instruments that exist today as they become digital.

Current market participants and individual actors have built a network of entrenched, disparate frameworks around centralized models to constantly reconcile and address the inefficiencies of a fragmented marketplace. This makes the incumbent capital market infrastructure slower to adopt and transition to new operating practices that DLT technology enables. Over time, the business practices that have evolved to manage the lifecycle require bespoke solutions to update, which can sometimes be an impediment to change.

To counter these impediments, some important enablers have been taking shape. These include standards, regulations, and interoperability. Standards such as ISDA's CDM reduce complexity. Regulations across multiple jurisdictions such as MiCA and the EU Pilot regime promote solutions at the global level. And finally, interoperability across legacy and new systems compliments new-to-new propositions like linking private and public blockchains.

In this paper, we make the claim that DLT has introduced three changes in the way capital markets operate. The first is a surge in the types of digital assets being traded, the second is an increase in the speed of traditional processes and conventions, and the third is the creation of new roles for traditional actors in the capital markets ecosystem.

This technology is allowing the industry to question and change some of the fundamental constraints of the existing asset infrastructure. For example, settlement cycles and times have shortened, which lowers counterparty risk. DLT's incorporation of the concept of shared truth opens the door to making heavy post-trade reconciliation processes redundant, lowering operational risk and streamlining workflows.

Central clearing counterparties' roles continue to evolve to service a world with lower systemic risk. This new risk profile occurs as atomic settlement—which lowers settlement and counterparty risks—becomes a widely adopted reality. This in turn means that capital that had been allocated to riskier processes can be more quickly deployed back into businesses.

Digital assets bring with them new investment opportunities such as bringing illiquid instruments within reach of more investors. Such assets were inaccessible before fractionalization. In addition, the new types of assets are bringing previously syndicated assets—such as infrastructure—to the broader market. This makes legacy asset types more accessible via enhanced liquidity discovery and tokenization. Since the provenance of digital assets is easily traceable, this increases trust among all market participants for both traditional assets (e.g. securitization) and new asset types (e.g. ESG).

1 Capital markets is a broad term that includes foreign exchange rates, credit, commodities, and equities products (which includes securities and derivatives, both exchange traded and over-the-counter).
2 Blockchain and Distributed Ledger Technology (DLT) are used interchangeably in this paper.

Yet, even as these changes have been deep and disruptive, the impact has not been uniform across the asset lifecycle. To explore what this means, we look into three parts of the asset lifecycle: pre-trade issuance, asset servicing, and post-trade clearing and settlement. For each of these, we detail the trends in the market around digitalization of the process flow and then describe the role decentralization and DLT has played. We do this with a combination of use case detail as well as industry analysis.

1 Pre-trade: Issuance

Issuance is when an asset is introduced to the world. The process of registration makes this a complex part of the asset lifecycle. The method by which an asset is registered can change with the characteristics of the asset (for example, a bond issuance is different from equity/shares), but in every case it is costly and time consuming. As a result, most innovations in this part of the asset lifecycle have been motivated by a drive for liquidity or by incentive to reduce costs and increase yields.

The liquidity motivator is reflected by increasing interest in institutional-grade digital assets. These can include less traditional asset types like infrastructure, real estate, and syndicated products among others. Tokenization has allowed smaller or non-traditional classes of investors to consider these assets for the first time.

Traditional issuers, such as banks, are experimenting with DLT in the issuance space. In addition there is a significant expansion of meaningful pilot projects by systemically important Financial Markets Infrastructures (FMIs) such as exchanges and Central Security Depositories (CSDs) and other types of service providers.

Together, investors, FMIs and regulators are driving the application of DLT for the issuance of assets. There are three ways in particular that DLT is changing the way that assets are issued today: easier issuance and significant reduction of the time to market, lower costs of issuance and introduction of previously "unlistable" assets. We describe each of these below.

1.1 Blockchain lowers the cost and time-to-market of security issuance

Among the many ways to issue equity in a company, Initial Public Offerings (IPOs) are the most popular. This is because an IPO provides a company access to a large, diverse pool of investors that they would otherwise have a very difficult time attracting.

Despite their popularity, IPOs are notoriously expensive, lengthy, formal, and not particularly transparent. This is in part because the process involves many actors and many different stages. The cost and complexity is one reason that some **recent high profile companies** decided to issue shares using a direct listing instead. A direct listing is less complex but has other challenges as well. For example, there is reliance on a direct share value from the market which provides less price certainty.

Issuing a bond or any other credit security can be equally complicated due to the number of actors it involves. This can include, on the low end: the issuer, law firms, banks, investors, and ratings agencies among others.

DLT can be used to improve both equity (the IPO or direct listing) and bond or other security processes to make the workflow more trackable and efficient.[3] By registering ownership of the assets on a shared ledger, any questions raised about registration can be more quickly investigated. This will make it easier to trace the ownership of the security. This also makes it clearer to discern who owns the security when, making it easier to process dividend or coupon payments when the asset is on chain.

3 An alternative, though not fully comparable method of raising capital that blockchain enables is Initial Coin Offerings (ICO). Unlike IPO and direct listing, ICO is not issuing equity in a company. ICOs use a combination of tokens and smart contracts to automate a process for simplicity. Because of the difference in function, we do not treat ICOs further in this paper.

1.2 Blockchain simplifies the issuance process

Not all asset issuances are publicly traded securities, yet all assets face difficulties in the listing process. Cap-table management is notoriously error prone in legacy systems for example. This is because the ownership structure that it represents is complicated, and the contractual and governance practices for private listings are lengthy to document.

DLT could contribute to ongoing improvements in the listing process by automating primary listings with straight through processing to settlement. The ledger could be used to record ownership as well as details about the transaction. DLT is uniquely suited for this task as its core function is to maintain consensus over information such as asset ownership.

The specific ways that companies are disrupting the issuance process includes **Agora**, which makes bond issuance easier, and **SDX**, which is a fully integrated issuance, trading, settlement and custody infrastructure for digital assets, regulated by FINMA.

Bond issuance today comprises multiple siloed workstreams. These many siloes require repeated reconciliations to catch errors from many manual processes each party is running and potentially exposing the issuances (which can be market moving events) to security breaches from data being sent in less secure formats across the different parties involved. **Agora** has used Corda to create smart bonds that regulate their own activity. The same agents remain involved in bond issuance, but the barriers between them are lowered.

Once shares are issued, they are listed on an exchange. This process is well understood for traditional listings, but most exchanges lack the capacity to build their own digital asset exchange platform. Such an undertaking requires not only new technical skills, but also compliance with newly issued regulations. **SDX** is a market infrastructure provider. It uses Corda as the foundation of its FINMA-regulated infrastructure for digital assets.

1.3 Blockchain brings liquidity to new types of assets

A final way in which DLT changes the issuance process is perhaps the most dramatic. Tokenization diversifies the universe of assets by bringing liquidity to new types of assets. This can happen in two ways.

- **Fractionalization:** The first way in which liquidity is introduced is through tokenization of existing assets that were not readily investible before. This category includes large, publicly funded projects, such as infrastructure, cashflows from commercial real estate, trade receivables and renewable energy among others. These assets were unlistable because there was no easy way to subdivide this type of asset (there is no concept of buying a piece of infrastructure like a bridge). DLT changes this by allowing a considerably simpler process of decentralized automated fractionalization, which breaks down large assets into smaller fungible parts for investment. DLT makes it easier to fractionalize the asset using tokenization to provide a secure and traceable way to divide an asset.

- **Traceability/provenance:** A second way in which liquidity is introduced is by listing assets which derive their value from provenance, such as commodities and fine art. These assets may already be tradeable but provenance is often murky and tracking ownership can be expensive. This concept is particularly relevant in traditional commodities. For example, **aXedras** is applying these concepts in metals, but they are also key for **ESG linked products**. In fine art, while it was in theory possible to issue paper certificates to split up the value of a painting, it was not a safe, secure and/or trusted method. Because DLT inherently includes provenance of transactions, it is possible to trace an asset back to origin with certainty if it originated on DLT. An additional type of asset in this segment includes those which are dependent on proof of ESG in their supply chains.

2 Asset Servicing

Another area where DLT can prove useful is asset servicing. For legal owners of an asset, this is the execution of their legal rights and obligations. This could include events such as paying or receiving dividends of a stock, stock splits, coupons on a bond/credit security and reporting.

Today, assets are tracked by their individual owners for as long as they hold onto the asset. But this chain of provenance is lost once they are sold. The difficulty of tracking asset history has become more problematic as listing practices change over time or differ across jurisdictions.

Historically, an asset was listed on a single exchange. This central exchange was responsible for all actions associated with that asset. Today, assets are not traded on only a single exchange. Alibaba is listed on both the NYSE and the Hong Kong Stock Exchange for example. The use of multiple listings changes the complexity of activities when an action is executed. The process of changing terms is no longer linked to the listing; instead, it is linked to custody of shares. In short, a disconnect has developed between the listing and the ownership.

Another example of how DLT might have been used in a high-profile servicing problem was the subprime crisis. DLT could have been used to track the mortgages that were included in the Mortgage Backed Securities. As the subprime mortgages started to default, the early warnings would have been picked up in a timely fashion and corrective action taken promptly.

DLT and tokenization can materially reduce the complexity of the servicing of the asset throughout its life. It enables us to track the asset as it moves between issuers. This allows greater automation of actions and increases transparency and accountability which in turn can attract more liquidity. We describe these in more detail below.

2.1 Blockchain automates corporate actions

The first real change that DLT makes to asset servicing is the application of smart contract functionality. This can attenuate the frequency of errors that result from corporate actions that need to be propagated through the various shareholders.

Smart contracts can programmatically execute actions while ensuring the standards and necessary governance are enforced at all times. For fixed income instruments, this allows interest payments and redemption to be included in the asset's self-executing activities. For equity-like securities, this could include dividend payments and stock splits for example.

The actions that are most amenable to **automatic corporate actions via smart contracts** are those that are objectively verifiable and deterministic (that is, can be programmed). Other features of assets cannot be automated but can be added as features into the contract, including: choice of law, reasonableness standard and materiality.

Asset lifecycle differs depending on the asset class. But in most cases the workflow needs to be synchronized and DLT can help facilitate the workflow. In many instances, traditional technologies perform actions sequentially when some can be done simultaneously. This feature alone can be transformational to many assets.

In private placements for example, there are new entrants such as **VALK** that are disrupting this space by formalising and standardising the workflow, which ultimately results in giving investors confidence to invest and bring liquidity to companies that otherwise could have greater difficulty in funding themselves.

3 Post-trade

The next stage in the typical asset lifecycle is post-trade. This includes both immediate processing of the asset and also settlement.

3.1 Immediate post-trade processing

When it comes to digitalization, immediate post-trade services have not innovated as quickly as other areas of capital markets infrastructure. We suspect that this is because global attention has been absorbed by the rise of novel types of digital assets. This has resulted in the reality that the early stages of the asset lifecycle are being redefined first. Because these new digital assets have not yet reached the stage where post-trade processing is needed or even possible, this part of the lifecycle has not faced the same pressure to innovate.

This is not to say that there is no need for innovation. Immediate post-trading activities of capital markets assets currently involve trade allocation, affirmation, confirmation and reconciliation processes. Operational errors can be costly when not resolved immediately. DLT has the potential to significantly reduce the operational burden of reconciliations and, in some cases, completely eliminate the need for it, given that the parties to a trade are constantly sharing the most recent version of the trade. Over time the industry has invested in technology to reconcile faster and therefore the straight through processing rates have been increasing significantly over the last 20 years. With DLT, immediate post-trade processes can be minimized, releasing firms from friction-producing middle office tasks.

3.1.1 Why blockchain has had limited impact

The post-trade process faces inefficiencies that are just as stifling as the other parts of the capital markets lifecycle. However, unlike other stages like issuance and custody, the types of solutions needed to address the challenges in the post-trade lifecycle have some fundamental differences.

The first difference is the cost of updating antiquated legacy systems. Moving these to a modern technology, even without DLT, will come at a cost compared to technology that is already taken as a sunk cost. While it is clear that this is needed, many market participants often take legacy technology as a sunk cost.

The second delay in innovation is regulation. Some derivatives are mandated to clear, which requires that trades go through particular types of intermediaries such as clearing houses. Of course, clearing houses are also playing a key role in digitising this workflow, particularly as **phase 6 of the Uncleared Margin Rules** due in September 2022 will bring new participants to this space who are less accustomed to clearing and respective processes.

There is another feature to regulation in the post-trade process: the fact that regulators are beginning to incentivize changes. The impact of the Securities Financing Transactions Regulation (SFTR) has been mainly on reporting and reconciliation, and the implications of its implementation are more standardized business processes that DLT and standards (common domain) can bring to life. This will in turn open up new opportunities, with more choice and access to wider sources of liquidity.

We are seeing projects that address the immediate post-trade inefficiencies such as **FragmosChain**, a multi-party platform that reinvents post-trade of capital markets transactions by streamlining interactions between financial institutions.

DLT enables participants to share the same record for both the economic and legal terms of their transactions. Operations can be synchronized between counterparties in near real-time, and trade events calculations are automated by smart contracts. Such collaborative processes eliminate most manual tasks and redundancies, resulting in dramatically lower costs and risks.

3.1.2 Other changes brewing: the move towards alternative exchanges

DLT is particularly well-suited to facilitate the processing of trades throughout their lifecycle from issuance to settlement. There are three types of alternative exchanges that have taken root across the globe. These include:

- **Traditional FMIs embracing DLT for a seamless workflow:** **NASDAQ's Digital Assets Suite** (NDAS) can enable a seamless workflow through the lifecycle of a digital asset. Another is the **Deutsche Borse** post-trade platform called D7, which launched in 2021. DLT is a shared ledger technology that enables all permissioned parties to access information at the same time in a trusted and secure fashion. This can allow for same-day settlement, as we see today with digital currencies.

- **Digital exchanges:** Innovation in post-trade processing has largely been driven by the demand for faster settlement. This demand in turn is increasing the use of DLT native exchange technologies. There are new exchanges that are competing with NASDAQ for example. As an example, Archax in London tokenizes traditional securities, while **SDX** in Switzerland is an infrastructure for natively digital tokens.

- **Other alternative exchanges:** These new exchanges can both compete to list the stock of existing companies or list new digital companies. They are able to provide market data at lower costs. You can buy shares on either a traditional exchange or a new digital exchange. The benefits here are for the broker-dealers operating on the exchange, since they are the entities seeking liquidity. **MEMX** is one example of these alternative exchanges. These types of exchanges may deal with traditional equity, but they are also looking at adding new digital assets. They are able to reduce the cost of market data and transaction feeds. Much of the reason that market data is expensive today is a result of the cost of the infrastructure that needs to be maintained. The way MEMX reduces costs is by having a 100% cloud-based infrastructure which is more affordable to operate.

DLT can bring efficiencies in ways that will allow emerging exchanges to gain competitive advantage. Take the example of ownership transfer. To do this atomically as part of a high-frequency order book requires low latency message transfer, as well as very careful engineering to make it sufficiently performant.

3.2 Collateral and settlement

Settlement is common to all asset classes. All assets involve cash flows and payments through the lifecycle. Perhaps because of this, of all capital markets activities, settlement is where the deepest disruption is being introduced by DLT. Two major forces enable such a transformation: the continuous desire to reduce systemic risk and the availability of the technology to do so.

Settlement risk is a perpetual area of focus for regulators given its role in crises and bank runs in the past. CLS was founded by several members to protect against one of the most significant risks in Foreign Exchange transactions. Not all currencies are covered by CLS and even for the ones in the service there is **increasing volume being settled without payment-versus-payment (PvP)** as highlighted by the BIS recently.

In securities, the desire to shorten settlement cycles has been increasing in recent decades. Capital markets functioned as T+5 until the early 2000s when they began to move to T+3. There was then another shift between 2014 to 2017 when markets moved from T+3 to T+2 (e.g. the UK changed in 2014 and US in 2017). Regulators had been pushing reductions from T+3 to T+2 since at least the 2008 global financial crisis. This means it took a decade for most major markets to reach T+2 settlement. It was a significant effort that required recommendations to regulators, regulatory prioritization and rules changes, and implementation on the ground. From that momentum, today the **movement continues towards T+1** as both buy-in and industry efforts increase.

The regulatory effort for settlement discipline and reduced settlement windows continues as per the Central Securities Depositories Regulation (**CSDR**) which is due to go live in February 2022.

Faster settlement is driven by a desire to reduce risk. There are three types of risk that can be attenuated by a shorter settlement window. These include: counterparty risk, operational risk and market risk. The longer a trade takes to settle, the greater the exposure to each of these risks.

DLT technology introduces the ground breaking potential for T-0 or instantaneous settlement. It can also support the financial industry on the journey towards T+1 settlement before there is a jump to T-0. The move towards T+1 is requiring significant investment from the financial community, but the benefits of less capital having to be allocated to settlement risk will accrue to both market participants and the wider economy. The optimal technology for such a move is one that enables atomic DvP or DvD for securities and PvP for foreign exchange.

3.2.1 Blockchain reduces risk and is being encouraged by regulators

As regulators recognize these benefits (lower systemic risk and greater liquidity to the wider economy), they are encouraging market participants to experiment this new technology with the **EU Pilot Regime**. Narrowing the settlement window reduces the risk associated with the process. DLT reduces settlement time by process automation; in particular, automation of the change of ownership of an asset. This both shortens settlement times and also access to funds. While regulators have been building the rules needed to increase the speed of settlement for more than a decade, DLT for the first time provides a technology that can increase speed without increasing complexity.

3.2.2 Tokenization improves collateral mobility

HQLAx is a digital technology company incorporated in Belgium that improves collateral mobility in high quality liquid assets. According to Belgian law, dematerialized high quality assets must be registered with a central registry (which acts as the official record of ownership). Due to this restriction, the operator of the platform must be a party to each transaction that takes place on the platform. This is a good example of a platform taking advantage of decentralization within the jurisdictions that already find it desirable and permissible. It is important to note that, depending on the jurisdiction, registries may be more or less decentralized. As different jurisdictions harmonize their rules and regulations, it is expected that more examples such as the above will appear to improve the collateral movements across the globe.

4 Conclusion

In this paper we looked at how traditional capital markets infrastructure is exploring and implementing DLT across the asset lifecycle. The number of use cases are expanding as standards, regulation and interoperability progress. As of today, some stages of the asset lifecycle such as issuance and settlement are already showing significant improvements from adopting DLT solutions.

In immediate post-trade processing, efficiencies are also beginning to be realized, with a significant push from traditional FMIs and regulators that are providing the framework to pilot wider adoption. While historically immediate post-trade has seen less innovation, it is where great efficiency gains and significant risk reduction can be achieved through mutualization and golden records. It is important that market participants critically assess their individual processes and realize the benefits of distributed ledger technology which can also be effective in complying with upcoming regulatory changes, from the new Settlement Discipline Regime under CSDR to Uncleared Margin Rules (UMR) phase 6.

Other relevant links

- **DLT-Underpinning and Transforming Capital Markets**
- **The Future of Financial Services with Digital Assets**
- **Digital Assets: De-centralized Trading of Digital Assets on Corda**
- **Deutsche Börse's D7 Maps Out the Road Ahead for Digital Asset Servicing on Blockchain**
- **Using Blockchain to Automate the End-to-End Asset Lifecycle**

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New York
1155 Avenue of the Americas, 34th Floor
New York, NY 10036

London
2 London Wall Place, London
EC2Y 5AU

Singapore
8 Robinson Road,
Level 14-02
Singapore, 048547

São Paulo
Av. Angélica, 2529 - Bela Vista, 6th Floor
São Paulo - SP,
01153-000, Brazil

Hong Kong
40-44 Bonham Strand
7F Sheung Wan
Hong Kong

Dublin
50 Richmond St. South,
Saint Kevin's, Dublin,
D02 FK02