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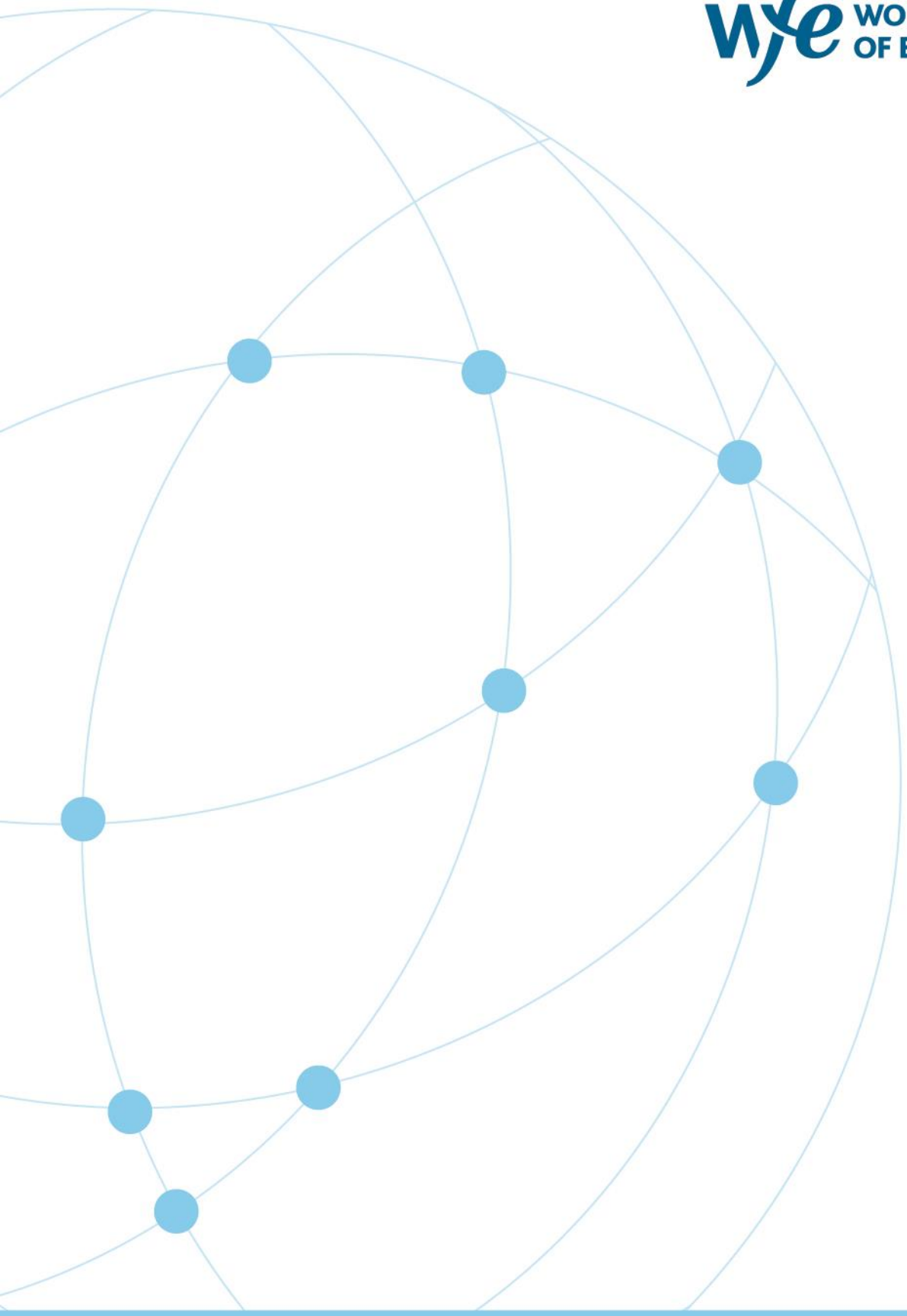

# Demystifying Tokenisation: Embracing the Future

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# Background

Established in 1961, the WFE is the global industry association for exchanges and clearing houses. Headquartered in London, it represents the providers of over 250 pieces of market infrastructure, including standalone CCPs that are not part of exchange groups. Of our members, 36% are in Asia Pacific, 43% in EMEA and 21% in the Americas. The WFE's 87 member CCPs and clearing services collectively ensure that risk takers post some $1.3 trillion (equivalent) of resources to back their positions, in the form of initial margin and default fund requirements. The exchanges covered by WFE data are home to over 55,000 listed companies, and the market capitalization of these entities is over $111tr; around $124tr in trading annually passes through WFE members (at end-2023).

The WFE is the definitive source for exchange-traded statistics and publishes over 350 market data indicators. Its free statistics database stretches back more than 40 years and provides information and insight into developments on global exchanges. The WFE works with standard-setters, policy makers, regulators and government organisations around the world to support and promote the development of fair, transparent, stable and efficient markets. The WFE shares regulatory authorities' goals of ensuring the safety and soundness of the global financial system.

With extensive experience of developing and enforcing high standards of conduct, the WFE and its members support an orderly, secure, fair and transparent environment for investors; for companies that raise capital; and for all who deal with financial risk. We seek outcomes that maximise the common good, consumer confidence and economic growth. And we engage with policy makers and regulators in an open, collaborative way, reflecting the central, public role that exchanges and CCPs play in a globally integrated financial system.

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**Demystifying Tokenisation: Embracing the Future**

Distributed ledger technology (DLT), initially introduced as the foundation behind cryptocurrencies like Bitcoin, holds the potential to alter the fabric of traditional finance if implemented in a safe, sound and fair way. At the heart of this change is the concept of tokenisation. Tokenisation involves converting ownership rights or assets, which have traditionally existed as physical or centralised electronic records, into digital tokens on a distributed ledger. These digital tokens represent real-world assets, ranging from securities to real estate, art and commodities.

This paper will present tokenisation as a natural evolution in the financial industry. Following the move from paper share certificates to dematerialisation, tokenisation possibly represents the next step for traditional assets. Tokenisation maintains the core principles of traditional assets, such as ownership and regulatory compliance, while offering potential over traditional assets. Rather than a radical departure from the norm, tokenised traditional assets should be viewed as nothing more than a modernised and innovative iteration of traditional finance, providing new opportunities for investors and market participants.

Nevertheless, some benefits are overplayed by vocal proponents of tokenisation. Continuous 24/7 trading and same day settlement can be achieved without tokenisation. Disintermediated models face conflicts of interest; and, instantaneous settlement in tokenised trading may have unpredictable timing, affecting market liquidity and trading costs, especially if assets and funding needs to be blocked prior to execution.

It has been over 15 years since the Bitcoin white paper and tokenisation has not 'taken off' in traditional markets. This is because current DLT faces challenges in high transaction environments. There are also interoperability challenges, high implementation costs, and regulatory uncertainties associated with tokenisation.

The paper concludes that, tokenisation has many benefits that may make it the natural next step for financial markets. However, some of these "benefits" need to be examined with a critical eye. Moreover, the move to a tokenised system requires substantial upfront investment from all market participants without clear gains in markets that are already highly efficient, like equity.

## 1. Introduction

Tokens utilise Distributed Ledger Technology (DLT), a decentralised digital system that records and verifies transactions across multiple computers or nodes. Unlike traditional centralised systems where a single entity (e.g., a bank, a financial market infrastructure, or a government) maintains a central ledger, DLT operates on a network of computers, and each participant maintains a copy of the ledger.

Traditional assets, such as stocks, bonds, and commodities, represent ownership rights or claims on an underlying asset or cash flows. Tokenised assets can mirror this fundamental concept of asset ownership by digitally representing ownership and keeping intact the legal rights and obligations associated with the asset.

It has already been acknowledged in some jurisdictions that tokenised traditional assets offer the same ownership rights as their traditional counterparts, and they are being regulated as such. In the

United Kingdom, the Financial Conduct Authority generally considers that tokenised securities fall within their existing regulatory framework.[1] Similarly, the Swiss Financial Market Supervisory Authority considers that tokens can be classified as securities and be subject to existing regulation.[2]

Furthermore, tokenised assets can be traded on secondary markets with relative ease. This makes them similar to traditional assets. As long as the markets that are permitting their trading are subject to robust regulation, supervision and governance - like exchanges currently are - then tokenised traditional assets can simply inherit the well-functioning traditional markets that already exist.

**2. The Evolution of Traditional Assets:**

The history of traditional assets is closely linked to technological developments.[3] Initially, ownership of traditional assets, like securities was recorded on paper certificates. These physical documents represented ownership rights to assets such as stocks, bonds, and real estate. In the early days, investors acquired these certificates as proof of ownership, which detailed the asset, owner, issuer, and value.

As financial markets grew, centralised clearing and settlement systems emerged. Stock exchanges and financial institutions took on the responsibility of recording ownership changes and facilitating the transfer of paper certificates. This system introduced a level of efficiency and standardisation. Gradually, settlement times decreased over the years, moving faster towards instant settlement. For instance, the New York Stock Exchange moved to a computerised system in the late 1960s, significantly reducing settlement times.

However, the system was still dependent on physical certificates, leading to delays and the risk of loss or forgery.[4] Instead of physical certificates, ownership was recorded electronically in centralised databases. This digital representation of ownership simplified the transfer of assets and reduced the risks associated with paper certificates such as the risk of theft or loss, or counterfeiting. Central Securities Depositories (CSDs) played a key role in dematerialising paper certificates and eliminating the need to settle trades with physical transfers.

Through dematerialisation, paper certificates transitioned into their electronic form. This transition, which took place globally in the late 20th century, bolstered efficiency, reduced costs, and enhanced the security of asset ownership records. Centralised depositories played a crucial role in managing electronic records of securities ownership. These institutions ensured the accurate transfer of ownership and settlement of trades. Today, most securities are electronic book entries, with the details of who owns them typically maintained by a CSD.

The internet's rise offered investors online access to their securities holdings and facilitated swift and convenient transactions. This led to a growth in stock market participation by households. For example, in the United States direct ownership of publicly traded stocks increased by around 17%

[1] https://www.fca.org.uk/firms/cryptoassets

[2] https://www.finma.ch/en/~/media/finma/dokumente/dokumentencenter/myfinma/1bewilligung/fintech/wegleitung-ico.pdf

[3] "Financial Market History: Reflections on the Past for Investors Today" by David Chambers and Elroy Dimson

[4] "Managing Records in Global Financial Markets: Ensuring Compliance and Mitigating Risk" edited by Lynn Coleman, Victoria Lemieux, Rod Stone, and Geoffrey Yeo.

between 1989 and 1998.[5] This has had numerous positive effects, from wealth creation to portfolio diversification and further economic growth.

Settlement times continued to decrease across the globe. For example, London moved to T+2 in 2014. Now, we are seeing moves to shorten settlement cycles around the globe. The US, Canada, Mexico Jamaica and Argentina recently concluded a move to T+1 settlement. Similar moves are being considered worldwide, with the UK, European Union and Switzerland all exploring following suit, while India moved to T+1 in January 2023.

Traditional assets have transitioned from tangible paper certificates to centralised systems, digital logs, and internet trading. Each phase has sought to elevate efficiency, mitigate risks, and broaden market accessibility. The innovative use of DLT for tokenisation may simply be the next step in this evolution.

[5] http://ibhf.cornell.edu/docs/JFQA.pdf

**3. Tokenisation: How it Works**

Asset sourcing: The process begins when the owner or issuer of an asset identifies that the asset or use case would benefit from tokenisation. This step also includes identifying the structure to be tokenised, because the specifics will shape the process. For instance, tokenising a money market fund is different from tokenising a carbon credit because each requires a different approach due to their unique regulations and characteristics. Financial instruments require strong compliance, while environmental assets involve specific regulations and stakeholder considerations. So, it helps to understand whether the asset will be treated as a security or commodity, which regulatory frameworks will apply, and which partners will be engaged.

Token issuance and custody: Creation of a digital, blockchain-based representation begins with immobilisation of any related physical asset (process by which physical securities are held in a licensed central depository for the account of the beneficial owners of such securities). Then a digital representation of the asset is created on a blockchain in the form of a token with embedded functionality—that is, code for executing predetermined rules. To do this, the asset owner selects a particular token standard (ERC-20 and ERC-3643 are common standards), a network (private or public blockchain), and compliance functions to be embedded (for example, user transfer restrictions, freeze capabilities, and clawbacks). Once the digital asset(s) have been created, they are stored by a custodian or special-purpose broker–dealer pending distribution.

Token distribution and trading: The digital asset can be distributed to the end investor through traditional channels or through novel channels such as digital-asset platforms. The investor will need to set up an account, or wallet, to hold the digital asset, with any physical asset equivalent remaining immobilised in the omnibus issuer account at the traditional custodian. Depending on the issuer and type of asset, the owner may enlist a secondary trading venue to create a liquid market for these tokenised assets post launch.

Asset servicing and data reconciliation: A digital asset that has been distributed to the end investor requires ongoing servicing, including regulatory, tax, and reporting, notice of corporate actions, and periodic calculation of net asset value (NAV). Servicing requires the reconciliation of off- and on-chain activity, as well as extensive data sources. The current tokenisation process can be challenging to navigate. It involves as many as nine parties (asset owner, issuer, traditional custodian, tokenisation provider, transfer agent, digital custodian, or special-purpose broker–dealer, market operator, distributor, and end investor), two more than the traditional asset process. Furthermore, some tokenised assets will continue to exist in both physical and digital instances, each with its own data systems to be synchronised and its own servicing needs making interoperability of the utmost importance.

**4. The Benefits of Tokenisation**

Tokenisation can offer a range of benefits across various industries and asset classes. One of the advantages of tokenisation is **fractional ownership**. Fractional ownership allows multiple investors to own a share of an asset. This lowers the capital requirement for individuals to invest in high-value assets and enables access to investments that may have been out of reach for many. This lower barrier to entry makes investments accessible to a broader range of participants – a particularly laudable goal considering the current cost of living crisis and the need to invest in long-term assets for financial goals such as home ownership or retirement. This accessibility promotes **financial inclusion**, allowing individuals with limited resources to diversify their investment portfolios – a key benefit for investors and wider society.

Fractional ownership makes these become more easily tradeable and accessible which can lead to **increased liquidity**. This is a particularly exciting prospect for traditional assets like real estate or private equity that can be illiquid and involve lengthy settlement periods. It also might help increase liquidity in less liquid products such as precious metals other than gold.

Furthermore, the distributed ledger technology underlying tokenisation provides a transparent and immutable ledger of ownership records and transaction history. Whilst investors with low levels of technical know-how may need help to do so, they can verify ownership and track the provenance of assets, **increasing trust** and reducing the risk of fraud. Authorities would also be able to track the ownership of assets thereby reducing money-laundering, terrorist financing and tax evasion.

**5. False Narratives:**

Some proponents of tokenisation will argue that there are other benefits to tokenisation. However, these can be overexaggerated, may not exist or may not be beneficial. Firstly, **continuous or 24/7 trading** can be achieved without tokenisation. Several exchanges offer 24/7 trading (or close to) of certain products, and the forex market is open 24 hours a day, five days a week, because the forex exchanges in North America, Europe, Asia, and Australia are open at staggered and often overlapping times.

Continuous trading has costs and benefits. It can enhance global accessibility, reduce gaps in stock prices, provide hedging opportunities, offer flexibility for traders, and potentially enhance liquidity in the market. On the other hand, continuous trading may increase volatility and market fragmentation, pose operational challenges, raise market abuse risks, potentially reduce market depth, and confer advantages to institutional investors over retail investors. Ultimately, if there were more benefits for 24/7 trading, then there would be more demand for it and markets would all already operate in this fashion.

Secondly, **reduction in the number of intermediaries or disintermediation** may not be beneficial at all. Crypto-asset platforms are one example of disintermediated business models and they have been fraught with conflicts of interest which is why regulators are now seeking to regulate them more closely. Moreover, whilst investors could be empowered to decide whether they need custodians, for example, as they could utilise 'self-custody' solutions, in reality, most investors are more likely to be safer utilising a regulated custody solution (a subject the WFE will cover in a further report). Initially, it would seem that "cutting out the middle man" would reduce costs for end investors but in reality it also increases the burden on them as they are forced to undertake the activities of the intermediary themselves.

Thirdly, and closely linked to the above, **instantaneous settlement** is another often argued benefit of tokenisation. At first, it may seem like a no-brainer – why would anyone want to clear when you could have immediate settlement? However, in practice, it is not that simple and, the attraction of being able to trade without necessarily having to have all the funds available up front seems to remain strong, even if experimentation with immediate settlement continues. Where settlement is not instantaneous, the cost of having to post margin (to cover risks associated with the trade not settling) is generally quite low, with the collateral being returned once the trade is complete. And, for those market participants with offsetting long and short positions, the collateral requirement will only be for the net position, with multilateral netting delivering considerable network benefits.

"Instantaneous settlement" is also not always instantaneous. As highlighted by WFE research,[6] DLT settlement of crypto trading typically takes around 10 minutes. Although this is shorter than the traditional T+1/T+2 settlement period, the timing is unpredictable, ranging from 6 minutes to 15 minutes, for instance. Our research indicates that when DLT settlement takes longer, market liquidity decreases, and trading costs increase. This phenomenon is primarily attributed to the uncertainty surrounding those few minutes of DLT settlement. For instance, there are no trusted entities (i.e., CSDs) overseeing the process. Additionally, without clearing, traders do not receive their money/crypto until settlement and are unable to immediately use those proceeds for other transactions.

**6. Factors Limiting Tokenisation**

Despite the potential advantages of tokenisation of traditional assets, its adoption has been limited. It has been over 15 years since Nakamoto published a white paper on Bitcoin, so the technology is no longer new. The technology has not lived up to the initial hype, as with most technological advances, and there are several reasons why.

Firstly, current **DLT has limitations**, particularly in high transaction environments. In other words, the technology is currently not fast enough to execute and settle all the trades running through a highly active exchange in any given moment. There are also other limitations such as storage problems caused by the distributed ledger.

Secondly, the nature of different DLT being created means that there is a **fragmented infrastructure**. Tokenised assets are managed on different blockchains, each with its own functionality and liquidity profile. As these are not interoperable, financial institutions would have to build connections with each platform, leading to significant operational costs and challenges. All of these mean that there are only marginal efficiency gains in certain markets, particularly those that are already liquid enough that the benefits might not necessarily outweigh the costs or risks of attempting new technology. For example, no member of the WFE has yet launched a tokenised equity market because these markets are already very efficient.[7] This all results in **interoperability challenges** across financial institutions, posing risks and causing fragmentation of liquidity.

[6] See WFE research paper: The effect of DLT settlement latency on market liquidity

[7] "Tokenised stocks" do exist and are currently traded on crypto-asset trading platforms but they are not actually stocks. They are "Mirrored" using the mirror protocol which does not require the mirrored asset to be underpinned by the actual asset. For example, the Mirrored version of the Apple share does not need to be

There are also **significant sunk costs** involved in implementing DLT. It is a capital-intensive investment to move to the new technology and build the relevant infrastructure. These costs would be felt across the market, from infrastructure providers to market participants and end users. Even if a market infrastructure provided these services, there may not be sufficient demand if customers do not have the correct infrastructure or capital to invest, further exacerbating the problem of high sunk costs.

There is also a lack of **regulatory certainty** that comes with tokenisation. Whilst the situation is improving, thanks to the efforts of regulators and industry, most jurisdictions' bodies of law do not reflect the creation of tokenised assets. This leaves firms with a worry that anything they do could become illegal when the government eventually decides to legislate.

For these reasons, exchanges have not widely adopted tokenisation. And, the lack of adoption further inhibits tokenisation. This is because of the **network effects**. Without widespread use, there is little value to firms and exchanges to update their technology stacks to incorporate tokenised assets. And, without firms and exchanges updating their technology stacks, there will not be widespread use.

This is particularly true where **market depth** is concerned. Strong market depth allows traders to place bulk orders without creating significant price movements. The best way to attract market depth is by attracting a larger pool of investors, particularly large wholesale traders, to help develop the depth of an order book.

**7. Regulatory Landscape:**

Tokenised assets, while offering many benefits, also present regulatory challenges and concerns that need to be addressed for their widespread adoption and integration into the financial system. Many jurisdictions are still in the process of digesting and understanding what tokenisation means. This means that **legal rights, regulations and guidance** are lacking in some parts of the world.

This lack of clarity can create uncertainty for issuers, investors, and exchanges. The current situation in the United States is a good example of this: Congress is somewhat split on the idea and until they can provide legal certainty, regulators are forced to try and impose rules through enforcement and the courts.

Achieving **regulatory certainty** would help foster innovation through principles by trusted players like exchanges. But achieving regulatory harmonisation, or even compatibility with other jurisdictions, would further help to increase the appeal of tokenised assets. This in turn could help drive investor gains.

There has also been a degree of scepticism by regulators, particularly prudential regulators, which has put firms off considering tokenising assets. For example, the Basel Committee on Banking Standards (BCBS) capital requirements for tokenised assets has included an optional requirement to apply harsh capital treatments to all tokenised assets "distributed ledger technology (DLT) infrastructure…is still new and evolving and may pose various unforeseen risks."[8] Naturally, this concern did not extend as

underpinned by any Apple shares. To be minted, it only needs to be collateralised using an eligible asset such as the TerraUSD stablecoin (UST). Regardless of the underlying collateral, token holders are not shareholders nor are they eligible for dividends.

[8] Basel Committee on Banking Supervision – Consultative Document – Second consultation on the prudential treatment of cryptoasset exposures – June 2022 https://www.bis.org/bcbs/publ/d533.pdf

far as Central Bank Digital Currencies (CBDCs) which also utilise DLT and were exempt from this proposal. This is in spite of the commitment of all international standard setting bodies and most national regulators to support the "same activity, same risk, same rules" principle.

**8. Security and Transparency:**

Generally, regulators are particularly concerned about security, fraud, and hacking in tokenised traditional assets, so it is important to address these concerns. These are common occurrences with regards to cryptocurrencies and non-fungible tokens. There are four types of DLT private-permissioned, public-permissioned, private-permissionless, and public-permissionless (see table 1 on the following page). DLTs offer a spectrum of options tailored to specific needs of organisations and developers. It's crucial for investors and regulators to distinguish between them due to varying risk profiles. Common elements of cryptocurrency trading don't necessarily apply to tokenised traditional assets.

In public-permissionless DLTs like Bitcoin, the prevalent anonymity makes it hard to gauge participant trustworthiness. This obscurity can enable money laundering and obscure market manipulation. While governance in such DLTs is theorised as decentralised, often, a few individuals wield significant influence, potentially sidestepping accountability. Contrarily, the other three DLT types involve centralised control, beneficial for regulatory oversight and fostering trust among market participants.

Public-permissionless DLTs are also subject to problems around **taxation** and **money laundering**. These types of DLTs can obscure ownership and transfer of assets which makes them difficult to tax and possibly easier to launder money with.

According to Chainalysis: "in 2023, illicit addresses sent $22.2 billion worth of cryptocurrency to services, which is a significant decrease from the $31.5 billion sent in 2022. Some of this drop may be attributed to an overall decrease in crypto transaction volume, both legitimate and illicit. However, the drop in money laundering activity was steeper, at 29.5%, compared to the 14.9% drop in total transaction volume."

Almost all examples of tokenisation of traditional assets have used one of these, namely private-permissioned DLTs to function. This means that the systems are not completely open and are therefore more safe and secure from cyber criminals than public-permissionless DLT. The private permissioned nature of these platforms do not increase the issuer's cyber risk exposure either. Moreover, the restrictions in place mean that identifiable parties can be held accountable for regulatory requirements, such as KYC, AML/CFT and consumer protection. Permissioned DLTs only enable trusted third parties to be involved in the updating process. This protects against issues seen in public-permissionless where more computationally intensive mechanisms are required to validate transactions. In some cases, permissioned DLTs can only have their ledgers updated by one entity which provides accountability. It also means that, if an error occurs, it can be rectified more easily.

Transaction initiation is limited by private DLs. Similar to an account-based system, where users must apply to open an account before they can use the system (or at the very least open an account at an intermediary that has access), this method requires users to apply to open an account. Private DLs can therefore mimic the limitations in the present account-based systems. They can, however, be made to provide access.

**9. Conclusion:**

Tokenisation may be the next phase for traditional assets, after the shift from paper share certificates to dematerialisation. Tokenisation offers benefits in terms of liquidity, accessibility, transparency, and efficiency while upholding the fundamental elements of traditional assets, such as ownership and regulatory compliance. Tokenised conventional assets should not be seen as a drastic break from the norm, but rather as a creative and modern version of traditional finance that offers new possibilities to investors and market players.

Tokenisation offers numerous potential benefits across industries and asset classes most notably related to fractional ownership, enhanced liquidity, enhanced trust and reduced fraud risk. All of these could lead to greater financial inclusion, diversification and ultimately economic growth. Nevertheless, tokenisation has not achieved considerable traction for two reasons. Firstly, some of the supposed benefits of tokenisation are over-exaggerated or simply do not exist. Secondly, existing limitations of the infrastructure, the tokenisation of assets has not arrived as quickly as some may have expected.

**Annex**

| | Private-Permissioned DLT | Public-Permissioned DLT | Private-Permissionless DLT | Public-Permissionless DLT |
|---|---|---|---|---|
| **Access Control** | Restricted to a specific group of known and trusted participants. Access is tightly controlled, and participants require permission to join the network. | Allow anyone to participate in the network. However, participants must go through a permissioning process to access certain features or functions of the network. | Open to anyone who wants to join. However, participation might be restricted in terms of functionality or data access. | Open to anyone without requiring permission. Anyone can participate, access the network, and engage in transaction validation. |
| **Identity Verification** | Mandatory for all participants, and their identities are known to each other. This ensures a high level of trust and accountability among participants. | Required for specific actions or roles within the network. Access to more advanced features or consensus participation might require participants to reveal their identities. | Required for specific actions or access levels. The network remains open. | Participants can operate with a degree of anonymity, represented by cryptographic addresses rather than real-world identities. |
| **Governance** | Often centralised and controlled by the participating organisations or consortium. Decision-making is typically internal and based on agreements among the participants. | Can vary. Some elements may be governed by a centralised entity, while others are determined by the network's consensus rules or possibly both. | Can vary. Some aspects may be governed by consensus rules, while others are controlled by a central entity or consortium. Possibly both | Decentralised and typically relies on consensus mechanisms. Decisions about protocol upgrades and rule changes are made by the community of participants. |
| **Use Cases** | Used for business applications where privacy, control, and compliance are critical. | Used for applications where certain participants need a higher level of trust or accountability than in fully permissionless networks. | Used in scenarios where openness and decentralisation are desired, but access restrictions or enhanced features are needed.<br>Use cases could include open-source projects, research, or applications requiring a balance between openness and control. | Best suited for applications where censorship resistance, decentralisation, and openness are paramount. Common examples include cryptocurrencies like Bitcoin and Ethereum, as well as various decentralised applications (DApps). |