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LEGAL AND REGULATORY CONSIDERATIONS FOR DIGITAL ASSETS

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Foreword

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2020 has been a pivotal year for digital assets. The cryptoasset and decentralised finance (DeFi) worlds continue to grow at pace, characterised by a heady mix of innovation, risks and regulatory challenges. Stablecoins remain a topical subject of debate, including concerns raised by major central banks on the impact of privately-issued digital currency on the wider financial system. Finally, and perhaps as a consequence, rarely a day goes by without a news items on the steady progression towards central-bank-issued-digital currencies (CBDCs).

However, the development of a more coherent and comprehensive framework of legal and regulatory perspectives with regards to digital assets continues to lag behind. In part, this is due to the challenge of reconciling divergent perspectives between regulators, the regulated and the associated legal bodies across multiple jurisdictions regarding asset nature and functionality, with even the nomenclature generally differing for the same fundamental asset.

Recent publications by the Financial Action Task Force (FATF), the Financial Stability Board (FSB), and the EU regulatory authorities – amongst many others – have helped build an evolving consensus on these issues. However, a more generic approach to an asset taxonomy, grounded in the principle that "new" digital assets fundamentally relate to well-known legal concepts, would be useful addition to the current debate. The objective of this study has been to develop a conceptual framework that helps regulators, the regulated, and legal bodies from any jurisdiction to identify and consider some of the key questions to ask when it comes to analysing the regulation and legality of different types of digital assets.

Furthermore, as detailed in the report, the regulatory treatment of novel ways of representing and transacting economic value has received comparatively more attention than questions relating to the core of private law – in particular with regard to property law. While the regulatory aspects are essential to an orderly and well-functioning market in cryptoassets and digital assets more broadly, this study's analysis puts private law considerations at the centre given its importance as the basic foundation for commercial certainty. Increasingly, attention is now turning to these private law questions—evidenced by, for example, the UK Jurisdiction Taskforce's 2019 *Legal statement on smart contracts and cryptoassets in English law*, a European Law Institute project on access to digital assets, and indeed draft legislation around the world. Given the nature of digital assets and their potential usage patterns, one cannot decouple the quest for regulatory clarity from the search for legal precision.

This report is based on past and ongoing research of digital assets by the Cambridge Centre for Alternative Finance (CCAF) as well as the findings of a research project conducted with the Stock Exchange of Thailand (SET), which served as a real-world testbed for empirically validating our conceptual framework and analytical approach. We would like to thank the SET for supporting our research, with special thanks going to Kitti Sutthiatthasil. We would also like to thank colleagues from Invesco, a long-term supporter of the CCAF, for providing independent feedback on the report and support for research dissemination.

We hope that this study will be a constructive contribution to the ongoing debate and our collective understanding of digital assets.

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Executive Summary

The years following the 2017 frenzy of blockchain-based token offerings have seen a significant uptick in regulatory responses, on a global level, to address the growing market interest in "digital assets". Many regulatory agencies and government bodies have sought to provide greater clarity on the treatment of digital assets by issuing frameworks to classify different types of "digital tokens". Largely inspired by "cryptoassets" delivered by public and permissionless networks, these approaches generally tend to prioritise the underlying technology and the asset form ("digital token issued on a blockchain using cryptography"), rather than the substance and nature of the asset itself ("does it refer to an existing legal concept?") (see **Section 2**).

As a result, confusion arising from the inconsistent use of terminology and the lack of clear definitions seems to have created further uncertainty between both market participants and supervising agencies. In particular, the terms "digital asset" and "cryptoasset" appear to be used in various contexts with incompatible and often contradictory interpretations.

CCAF has consistently argued that *digital assets*, for the most part, pertain to existing and well-known legal concepts: they effectively represent a set of rights embodied in a new digital form (**Section 1**). Consequently, the regulatory perimeter for regulating digital assets and associated activities should be determined by identifying the legal concept(s) behind a given digital asset.

Conversely, CCAF has been using a narrow definition for *cryptoassets* that focuses on the exclusive novelty that fundamentally separates them from other assets: "Digital tokens exclusively issued and transferred via open, permissionless DLT systems that play an indispensable role in the economic incentive design of the underlying shared ledger or application". Unlike other digital assets, cryptoassets are neither a corporeal object, nor a right to something, and consequently are more difficult to accommodate under existing legal frameworks.

This, however, does not mean that digital assets do not warrant adjustments or revisions to existing legislations. Their digital form enables different kinds of expressiveness and functionalities (e.g. encoding rights and obligations directly into the asset), new types of custody and ownership via the use of cryptographic keys, and alternative forms of value transfer, that all do sometimes conflict with definitions found in existing legislation.

For instance, many legal frameworks do not recognise incorporeal objects as fitting objects of property rights. Such questions will need to be examined by the legislature of each jurisdictions to provide legal certainty to market participants, and other stakeholders such as regulatory authorities for the digital asset ecosystem vision to move forward. These critical legal questions are discussed and analysed in **Section 2**, which also highlights the adjustments made in legal systems around the world to address some of these legal issues. It should be noted that these adjustments are highly jurisdiction-specific and jurisdictions globally are still in the process of developing comprehensive answers to these questions according to the prevailing law. This section deals with common law, civilian, and mixed legal systems at an appropriate level of abstraction. The aim is to identify general trends and concepts rather than to provide granular analysis of any given jurisdiction's legal position.

It is also worth highlighting that the choice of the underlying technology deployed to support emerging digital asset use cases has the potential to reshape activities and roles encountered in traditional capital markets, in particular when considering shared, distributed ledgers that can be jointly maintained and operated by distinct entities. This fundamental transformation of key financial market infrastructure at its core can engender legal and regulatory implications. Notably, the dominant technical component and potential shared responsibility calls for the establishment of clear standards in terms of infrastructure, security, and governance. Some of these implications are explored in **Section 3**, to the extent that they have been identified.

However, it is expected that a number of legal and regulatory considerations will gradually become apparent over time once more information and certainty around the platforms and use case designs become available. For this reason, a conceptual framework is introduced in **Section 4** to help assess assets according to four dimensions: rights, representation, issuance, and transferability. This framework is meant to serve as a tool for analysing and comparing different digital assets created for various business cases in a standardised manner to facilitate the identification of relevant legal and regulatory implications.

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1

Asset Taxonomy

Section 1: Asset Taxonomy

Taxonomy is the science of classification by identifying different entities or objects, establishing criteria for classifying them into distinct categories and sub-categories, and naming them. This practice introduces common definitions, terminologies and semantics which can be used across multiple systems.

A common system of categorisation is important because it provides a unified view and enables better understanding, communication, and management of a diverse collection of entities or objects and facilitates the handling of new and evolving additions as they appear.

At present, a common system of categorisation does not exist for digital assets. This is a barrier to the regulation and management of digital assets which often exist in an international and multi-jurisdictional environment.

This section seeks to assist in the development of a common system of categorisation by first examining various digital asset classification frameworks which have been established by different regulators. Limitations and inconsistencies among these preliminary attempts at classification are discussed. Then a coherent alternative for asset classification is proposed which includes a generic definition of *digital assets* and *cryptoassets* which captures the innovative properties of these assets and should stand the test of time.

1.1 Limitations of Existing Classification Frameworks

Existing classification frameworks

A number of regulators have issued classification frameworks for digital assets, generally token-oriented and significantly inspired by open and permissionless networks, that typically consist of three types: *payment/exchange tokens*, *utility tokens*, and *security tokens* (**Figure 1**).

Figure 1: Overview of major token classification frameworks

	Switzerland	ESMA	EBA	Singapore	Germany	Israel	Abu Dhabi	Thailand	Malta	IMF	UK
Used as a digital means of payment or exchange	Payment token /Crypto-currency	Payment-type /Cryptoasset	Payment / exchange / currency token	Virtual currency	Payment token	Currency token	Crypto Asset	Cryptocurrency	Virtual financial asset	Payment token	Exchange token
Exhibits an investment purpose	Asset token	Investment-type Crypto-asset	Investment token	Equity / Security token	Equity token	Security / investment token	Security token	Digital token	Financial instrument	Asset (security) token	Security token
Grants holders access to a digital resource	Utility token	Utility-type Crypto-asset	Utility token	Utility token	Utility token	Utility token	Utility token	Digital token	Virtual token	Utility token	Utility token
										Bitcoin Type Cryptoasset	

2017 2018 2019

These taxonomies seem to be functionally oriented and to be technology neutral. However, it is our belief that existing taxonomies of digital assets developed by national and international authorities have failed to fully capture the relevant features of digital assets and the true novelty introduced by cryptoassets. The following subsection will outline the reasons behind this belief.

Significant limitation: conflating substance and form

While these introductory frameworks have been helpful as a first step in clarifying the regulatory environment for digital assets and related activities, they have a fundamental limitation: paradoxically, they have resulted in an excessive focus on asset form rather than the substance and nature of the asset.

Asset form refers to the manner in which a given asset is represented. An asset may be tangible (i.e. having a physical representation) or intangible (i.e. having only a virtual representation) — or both. In fact, a given asset can exist in different forms: for instance, the share of a particular company may exist simultaneously in the form of a physical share certificate and as a dematerialised security in the internal accounting system of a central securities depository. The fact that a given asset may take different forms does not fundamentally change the **substance** of the asset: it remains a company share, with all associated rights and obligations.

Existing digital asset frameworks, however, tend to focus primarily on the asset form and the underlying technology. Largely inspired by digital tokens issued on public and permissionless networks, existing frameworks tend to assume the use of distributed ledger technology (DLT) and cryptography are the dominant criteria ("digital token issued on a DLT system"). This ignores the fact that there are various alternative mechanisms and technologies to represent assets in digital form that do not involve DLT-based concepts. Moreover, existing frameworks often equate "digital assets" with "cryptoassets", thereby overlooking the key distinctive characteristics that sets cryptoassets apart from other digital assets (*see next subsection for more information*).

CCAF thus takes the view that digital asset classifications should instead be a function of their nature and substance, i.e. according to the rights and obligations they confer on the holder, as well as their main economic purpose and the function of the asset.

How can the form impact an asset?

A change in the form of an asset does not necessarily change its legal substance, but may result in new mechanisms for the creation, custody, delivery, and transferability of the asset, entailing legal ramifications. For instance, should a digital bond be treated similarly to a bond written on paper? While the nature of the asset, a "bond", is preserved, the digital form might impact the way the bond is transferred and, consequently, imply previously uncharted legal consequences.

Table 1 provides a comparison between the different forms an asset can take, as well as the different media that could carry its value, to establish potential implications for asset issuance, transfer, and transaction processing.

Table 1: Comparing form and medium for a given asset type

DIMENSION	Tangible		Intangible		
	Natural form	Token / Paper-based	Entity-controlled ledger entry	Shared ledger entry	Other
Issuance process	Depends (e.g. nature, artist, construction firm)	Central authority (e.g. central bank)	Registrar maintaining recordkeeping system	Depends (open or restricted)	Data creator
Accessibility/ Restrictions	Generally no restrictions but requires geographic proximity ("bearer asset")	Generally no restrictions but requires geographic proximity ("bearer asset")	Access needs to be granted by database operator	Depends on access policy (open vs. semi-open vs. closed)	Depends on asset type (e.g. file type, supported OS)
Transferability	Peer-to-peer (geographic proximity)	Peer-to-peer (geographic proximity)	Can be transferred within the system as specified by operator	Can be transferred within the system as specified by system and contract rules	Depends on asset type, but generally can be endlessly reproduced on distinct media
Transaction processing	Transaction parties physically handing over the asset	Transaction parties physically handing over the asset	Operator updates database record via new entry	Depends on system design and consensus participants	Replicate digital asset on a distinct medium
Transaction audit	Physical inspection, special equipment (e.g. XRF detector for gold purity)	Special equipment (e.g. watermark lamps for paper notes)	Only via third party (e.g. financial auditor)	Independent validation via full node	N/A (only possible to check hash for data integrity)
Transaction privacy	Private ("bearer transaction")	Private ("bearer transaction")	Generally, database operator has full visibility	Depends on system design and network access policy	Depends, but generally private

Recommendation 1

Regulatory authorities should focus on the substance of the underlying asset and the rights associated with it, rather than its form, unless the form changes the substantive nature of the asset.

1.2 Introducing a Different Approach

Alternative definitions

Digital assets

The term "digital asset" is broader than "cryptoassets". The term is broad enough, and has been used for a long time, to cover digital objects such as in-game objects but also conventional "dematerialised" company shares. More recently, it has been used to describe objects in modern DLT systems.[1] Unlike other intangible assets that are based on internal electronic recordkeeping systems (e.g. dematerialised shares), the key characteristics of these "new" digital assets are:

- **Expressive:** rights and obligations can be directly encoded into the assets and automatically executed.
- **Controllable via cryptographic keys:** cryptographic keys are required to access the assets and sign transactions to initiate asset transfers.
- **Compatible:** digital assets can, barring artificial restrictions, move freely across the system in which they have been issued and interact with other digital assets that exist within the same boundaries.

It might be tempting, at first blush, to count digital objects with these characteristics as "cryptoassets". For the most part, however, even these "new" digital assets relate to existing and well-known legal concepts, effectively representing a set of rights embodied in a new digital form. In our view, they do not therefore constitute a standalone category for the purposes of legal categorisation, at least; a DLT-based company share can be classified as a "digital asset" along its pre-DLT counterpart. "Cryptoassets", however, constitute a major exception.

Cryptoassets

While considered a specific subset of digital assets thanks to their exclusively virtual nature, CCAF has sought throughout its research to differentiate "cryptoassets" from other digital assets. This distinction is based on the novel characteristics that set them apart from other digital assets: (i) the lack of a formal issuer, and (ii) the unique incentive role performed in the underlying distributed ledger or application.

Cryptoassets are thus defined as "(i) a digital data unit that (ii) has no formal issuer, (iii) is exclusively issued and transferred via open, permissionless DLT systems, and (iv) plays an indispensable role in the economic incentive design of the underlying distributed ledger or application such that separating the asset from the underlying network would impair the system as a whole."

Unlike other digital assets, a cryptoasset is neither a corporeal object *nor a right to anything*, and is consequently more difficult to accommodate under existing legal frameworks.

A generic asset taxonomy

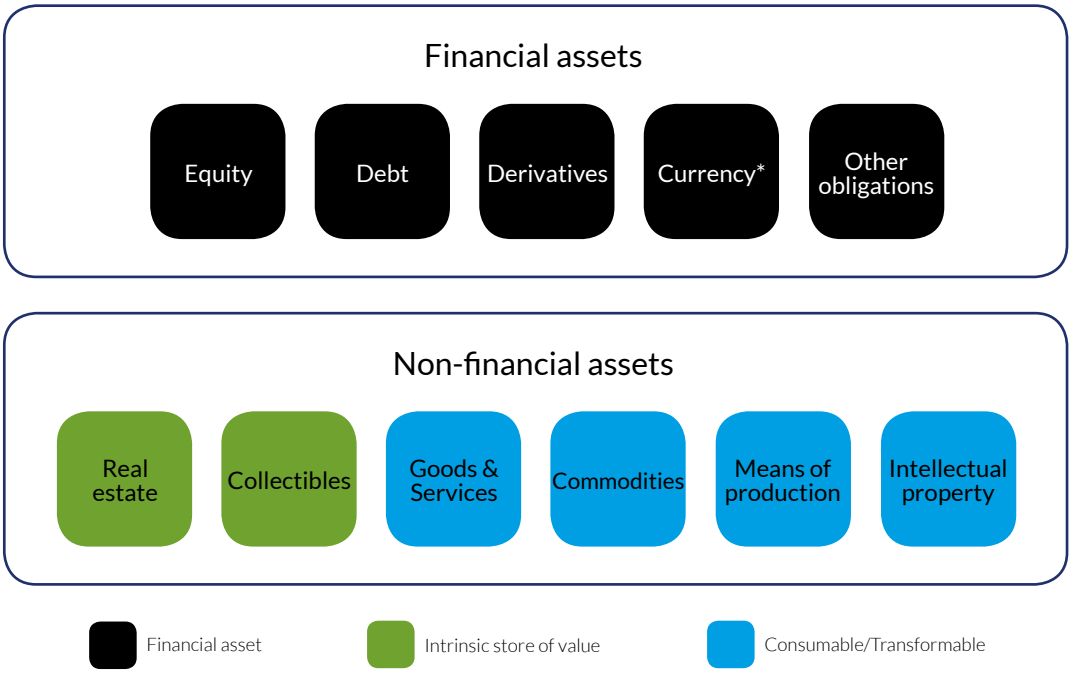
The following asset taxonomy has been developed to group various assets from the financial and non-financial worlds into classes based on the nature of the asset, irrespective of the form. The objective is to assist stakeholders in determining the legal and regulatory treatment of a given asset.[2]

The taxonomy divides assets into two major classes based on the existence — or lack — of a contractual claim that the asset holder may have against a counterparty. This key property draws the line between *financial assets* and *non-financial assets*.

1 We could defined these "new" digital assets as digital units of data in a shared system jointly maintained and updated by multiple parties that (i) can be directly controlled by the asset holder via cryptographic keys, and (ii) may represent a set of rights. It should be noted that a considerable number of digital assets that are marketed or portrayed as "cryptoassets" do not meet this definition. A prominent example would be XRP, issued by Ripple Labs, which, consequently, would be classified as another type of asset.

2 However, the reader should be aware that there is no perfect taxonomy: theoretical and practical challenges to classification systems are determined by the approach and perspective of those who conceive them. Therefore, taxonomies are not static in nature, but are continuously refined as knowledge and context evolve.

Figure 2: A bird-eye view of the asset taxonomy



**Currency* includes sovereign, private, and local/community currencies.

Financial assets

Financial assets are defined as assets whose value is derived from a contractual claim. As shown in **Table 2**, they are further divided into different categories according to the characteristics of a given financial instrument (e.g. type of interest, associated rights).

Table 2: Financial asset categories

Asset category	Definition	Examples
Equity	Value of a company divided into equal parts owned by shareholders.	Shares, convertible shares, units
Debt	Instrument offered as an investment and including a written promise to pay back the investor by a particular time.	Bonds, convertible bonds, medium-term notes, loans
Derivatives	Arrangement or product whose economic value derives from and is dependent on the value of an underlying asset.	Futures contracts, options, swaps
Currency	Medium of exchange in general use in a particular jurisdiction or community.	Local/community currency (e.g. Bristol pound), private currency, sovereign currency
Other obligations	Other responsibilities to meet the terms of a contract (e.g. monetary repayments).	

Non-financial assets

Non-financial assets are defined as assets whose value is derived either from direct usage (*consumables/transformables*) or from the asset's potential ability to retain value over time (intrinsic stores of value). Assets that qualify as intrinsic stores of value have the ability to maintain value over time, but cannot be consumed. Conversely, consumable/transformable assets derive their value from usage, either through consumption or transformation to produce economic output (**Table 3**).

Table 3: Non-financial asset categories

Asset category		Definition	Examples
Intrinsic store of value	Real estate	Tangible property made up of land as well as anything attached to it, including buildings, flora and fauna, and natural resources.	Commercial property, residential property, land, mineral rights
	Collectibles	Item with increasing worth than initial purchasing value due to its rarity and/or popularity.	In-game items, fine art, postal stamps, luxury items
Consumable / Transformable	Goods & Services	Basic products of an economic system consisting of tangible consumable items and tasks performed.	General goods & services, vouchers, games, entertainment services, SaaS
	Commodities	Raw materials or primary agricultural products that can be bought and sold.	Oil & gas (extracted), harvested crops, precious metals
	Means of production	Physical and non-financial inputs used in the production of economic value.	Production equipment, IT assets, raw materials
	Intellectual property	Intangible property that is the result of creativity.	Trademarks, patents

Classification is not always straightforward

It is not always straightforward to assign a given asset to a single category for two reasons. First, some assets are used in several ways depending on the context and may, thus, fall into two or more categories: for instance, gold is utilised both for industrial use (*consumable*) and as a *store of value*. Second, assets may evolve over time with changing user behaviour: for example, *consumables* such as luxury goods can also evolve into collectibles (*stores of value*) over time based on various factors.

Thus, the classification of an asset is not fixed, but requires a dynamic and ongoing assessment of its properties, usage, nature, and the rights it carries. Hence, asset classification is highly context- and usage-dependent, sometimes leading to asset's overlapping categories.

How do digital assets and cryptoassets fit in the taxonomy?

Cryptoassets, as defined by CCAF, do not represent any external rights or things,[3] and, consequently, do not constitute a financial asset. However, cryptoassets are used for different purposes, thus spanning multiple categories of the taxonomy depending on user behaviour and usage function.

Conversely, digital assets other than cryptoassets generally represent conventional financial assets that have clear economic functions and legal rights associated with them, which can serve as the basis for their classification. The classification of a digital asset that has undergone a "tokenisation" process (i.e. whereby an existing asset is digitally represented by a "token" on a shared recordkeeping system) will depend on the nature of its underlying asset.

"Tokenisation" drives the *financialisation* of an asset by creating a "bridge" between the asset and its digital avatar (i.e. the token). Once tokenised, certain aspects of the asset can be dealt with in isolation; operations can be performed by dealing with the "token" rather than the asset itself. **Section 2** of this report will discuss in greater details the legal implications and considerations associated with digital assets.

3 Some have argued that cryptoassets can be thought of as *digital commodities*. See for instance Kirilenko, A. (2019) *On Crypto Assets*. SUERF Policy Note, No 104. Available at: **https://www.suerf.org/policynotes/8135/on-crypto-assets/html** [Last accessed: 18 November 2019].

2

Legal and Regulatory Implications of Digital Assets

Section 2: Legal and Regulatory Implications of Digital Assets

This section explores how key legal concepts, such as *ownership* and *possession*, apply to digital assets. It also highlights the adjustments made in certain legal systems to adapt to the emergence of digital assets. While most of the questions raised in this section will have to be carefully examined by relevant authorities, some recommendations are provided to serve as a basis for future legal and regulatory discussions.

2.1 Tokenisation and Property Rights in Digital Tokens

Tokenisation: a new technology for an old process

"Tokenisation" is often presented as a novel process, but conventional forms of securitisation and financialisation involve something very similar. The essence of these processes is that the *economically and legally most important features of an asset are recorded*, and that written record is treated as an object that can be bought and sold on the secondary market.[4]

Historically, these processes were paper-based, and later came to rely on centralised digital information systems kept by intermediaries. Tokenisation is, in this light, merely a new way of doing something familiar. Like all technological developments, it promises to be more powerful than its predecessor technologies, but the essential steps in the process remain the same.[5]

But are digital assets "actual tokens"? Although it is common to refer to digital assets as "tokens", this terminology can be misleading in the legal context. In computer science, "token" means a programming object that represents the ability to perform an action in a software system. In law, the word usually connotes a tangible object. Cash is a "token-based payment system" because banknotes and coins are "tokens" of rights against the central bank. A bitcoin (BTC) is not really a "token" in this sense, as a leading commentator explains:

"The coin is only a notional entity, a convenient way of imagining the BTC value represented by the output associated with a public key. The coin representing the input to the transaction at [public key A] is destroyed and replaced by another coin representing the transaction output at [public key B]. We should not imagine the data string representing the coin... as being transferred… Value flows… by the consumption and creation of distinct informational entities at each public key."[6]

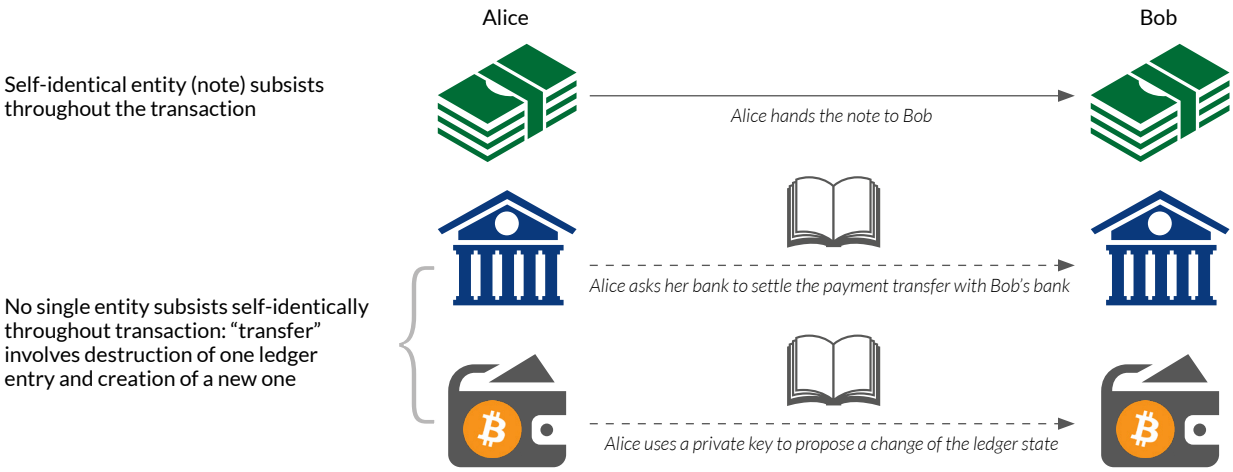
It may be useful in some contexts to speak about digital assets that represent rights in things or rights against persons as "tokens", because whether or not a "digital *res*" remains in existence throughout a transaction, there is a constant bundle of rights that persists. However, the word must not encourage analogies to systems such as cash that operate with the physical exchange of tangible tokens. Thus, if Bitcoin enthusiasts wish to make analogies between Bitcoin and money, they should rather look at bank account balances than cash (**Figure 3**).

4 For example, collateralised debt obligations, such as mortgage backed securities, result from a two-step process to abstract rights associated with the underlying asset (e.g. a house). In the first step, a mortgage transfers certain rights in a house to the mortgagee bank, while the mortgagor remains in occupation and the owner of record. This abstracts the economic value and the legal title from the house as a physical asset and establishes a bi-lateral legal relationship between the bank and the mortgagor. The second step, i.e. the creation of a mortgage backed security, further abstracts rights held by the bank and forms them into a financial asset that can be traded on the secondary market.

5 Derived from De Soto, H. (2001) *The Mystery of Capital*. Finance and Development, Vol.38, No 1. Available at: **https://www.imf.org/external/pubs/ft/fandd/2001/03/desoto.htm** [Last accessed: 09 December 2019].

6 See Green, S. (2019) *Cryptocurrencies in the Common Law of Property*. Cryptocurrencies in Public and Private Law, sect. 6.18.

Figure 3: Bitcoins, cash, and bank deposits compared



Recommendation 2

From a legal perspective, digital assets should be considered as analogous to book-entry or register assets (i.e. account-based), rather than certificates or cash (i.e. token-based)[7]. This departs from many popular accounts and even some technical legal accounts of digital assets.

Digital assets as "tokens" (of things and rights)

A common assumption behind tokenisation is that a token "captures" and "embodies" the most important features of an asset. A further assumption is that those features of the asset can be dealt with by dealing with the token, which requires the creation of a legal "bridge" between the token and its underlying asset. The "token" then becomes the relevant object: dealing with the token means dealing with the rights that it embodies. For example, ownership rights, like title to a house, might be transferred by transferring a digital token without affecting the occupation rights in that house.

Steps have been taken in various jurisdictions to construct this "bridge" and to ensure a certain and predictable legal and regulatory framework for digital assets. The details of each national framework necessarily differ according to the doctrinal and systemic features of the relevant legal system.

Liechtenstein's Token Container Model

Tokenisation is explained by the metaphor of a "container" in the model presented by recent legislative innovations in Liechtenstein. To enable the broadest range of applications of the "token economy", tokens represent rights. Everything that is used in the legal and economic system can be subsumed under this term. This entails that rights will be represented only digitally by means of "Trustworthy Technology" systems, such as blockchain and DLT, and will be subject to the validation and transfer processes of the technological system. The "token" is a type of "container" for the representation of a right, and dealings with the token are treated as dealings with the right. The Liechtenstein model accounts for the distinction drawn by CCAF between "digital assets" and "cryptoassets" by allowing for the case of an "empty" container; i.e. cryptoassets are tokens without any real-value collateral backing and represent only their own existence in the technological system.[8]

7 See Allen, J. G. (July/ August 2019) *Negotiability in Digital Environments*. Butterworths Journal of International Banking and Financial Law, p.459.

8 LLV (2019) *Report and Application of the Government to the Parliament of the Principality of Liechtenstein concerning the Creation of a Law on Tokens and TT Service Providers and the Amendment of Other Laws*. Report and Application of the Government to the Parliament of the Principality of Liechtenstein, No. 54/2019, p.58 (translation our own). Available at: https://bua.regierung.li/BuA/default.aspx?nr=54&year=2019&backurl=modus%3Dnr%26filter1%3D2019 [Last accessed: 12 December 2019].

Difficulties arise when it comes to work out how private law, in particular the law of property, deals with the token. Legal systems generally treat financial assets (e.g. share certificates) like tangible movable objects, but apply special rules such that dealing with the paper is tantamount to dealing with the rights the paper embodies. While some of the established rules of the law of financial instruments might apply directly to digital tokens, many of those rules will apply only by analogy and some will not apply at all where there is no paper instrument.

Delaware's amendment enables the issuance of uncertificated shares

The US State of Delaware has amended its legislative framework to authorise companies incorporated in the state to maintain shareholder registries and issue new shares on a blockchain-based system. Company shares issued on a blockchain will be considered "uncertificated shares". Consequently, outstanding certificated shares of publicly-traded corporations cannot benefit from this amendment.

Recommendation 3

Regulatory authorities should choose proper analogies to explain and clarify how private law, and in particular property law, apply to digital assets (e.g. tokenised company shares are more analogous to dematerialised "scripless" shares than to certificated shares).

Digital tokens and property rights

Distinct legal issues arise in the context of digital assets and cryptoassets, respectively. In the case of cryptoassets, it is commonly assumed that the token can be treated as an object of property rights even though it does not represent rights in a physical asset or rights against a counterparty. This is challenging because, while many legal systems treat certain rights as objects of property rights (i.e. rights in *rem*), they may not recognise purely intangible objects as fitting objects of all property rights. The right of ownership is particularly problematic. We might call this the "property problem", and it boils down to whether any given legal system is able to accommodate "digital commodities".

In the case of digital assets, the situation is somewhat easier for the reason that many legal systems do conventionally treat certain rights as intangible objects of property rights (i.e. *res incorporales*). However, the property problem still arises because many of these legal systems focus on the paper representation of the *res incorporales*: the paper certificate provides a tangible, movable *res* that is a fitting object of property rights. Thus, some systems insist on a (paper) global certificate in a vault somewhere to make the pre-DLT system of dematerialised company shares work. If we take the paper away, the property problem arises for digital assets of all kinds in such systems.

Aside from the property problem, the assumption behind digital assets is that performing legal operations on the token also effects operations with the rights it represents. In the context of digital assets, the question is whether performing operations with the intangible token in a *technical* system has *legal consequences* for "real world" rights (including rights in physical assets). We might call this the "expressiveness problem", and it boils down to the extent to which a digital asset successfully embodies the "real world" asset it represents and enables legally effective dealings with that asset.

Numerous jurisdictions are currently dealing with these problems, but the solutions adopted display a high degree of jurisdiction-specificity: many of them are *ad hoc* and may not translate well into other legal systems. For example, common law systems generally tend to take a more flexible approach to the

definition of what can be an object of property rights, and are possibly better suited to accommodating digital assets into their general law of property. In these systems, concepts tend to be less rigorously defined and definitions are often developed in judicial decisions.

Singaporean ICC's decision to treat cryptocurrencies as property

The Singapore International Commercial Court recently decided a case which required the court to determine whether bitcoins qualified as "property" under the applicable law.[9] The court referred to the classic test from the English case of *National Provincial Bank v Ainsworth* [1965] 1 AC 117, in which the House of Lords held that an object must be "definable, identifiable by third parties, [and] capable in its nature of assumption by third parties, and have some degree of permanence or stability" to qualify as an object of property rights. The court held that "cryptocurrencies" met all these requirements. Noting that there was academic debate as to the precise nature of the property right, the defendant in this case did not dispute that bitcoins were to be treated as property in a generic sense, and the court did not consider the question further. (*In Quoine Pte Ltd v B2C2 Ltd* [2020] SGCA(I) 02, the Singapore Court of Appeal did not need to decide the property question) The ICC decision has been widely quoted in the common law world and may indicate the direction of travel in common law systems.

High Court of England and Wales approves UK Jurisdiction Taskforce approach

In *AA v Persons Unknown* [2019] EWHC 3556 (Comm), the High Court of England and Wales endorsed the approach taken in the UK Jurisdiction Taskforce legal statement on cryptoassets and smart contracts that cryptoassets were prima facie capable of being "property" in English law, at least for the purposes of granting a proprietary injunction, effectively taking the same approach as the Singapore ICC set out above.

New Zealand High Court holds that "cryptocurrencies" are property

In *Ruscoe v Cryptopia Ltd (in Liquidation)* [2020] NZHC 728 the New Zealand High Court held that cryptocurrenciess are a form of "property" for the purposes of that country's corporation law legislation, and that they are capable of being held on trust by a company for its accountholders—and thus out of reach of the company's creditors. Interestingly, the court held that a separate trust was held for each class of cryptocurrency, on the basis of the way that the exchange operated.

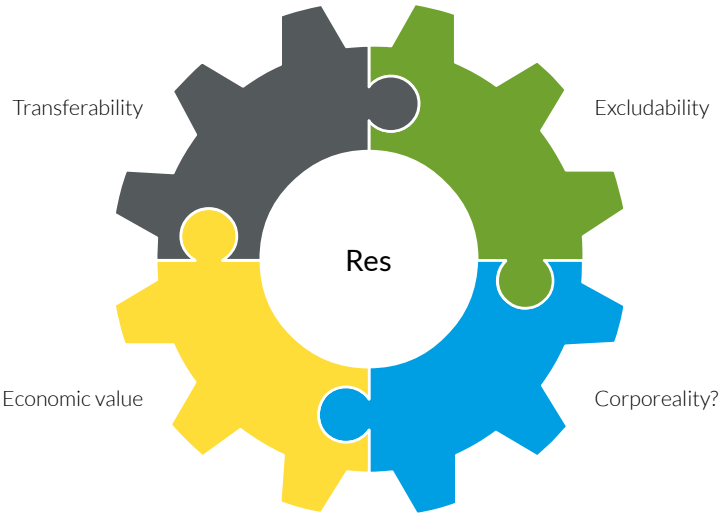
Finding a *res*

As outlined earlier, the genius of the law of financial instruments is that, by recording rights on a paper instrument, one can deal with the rights by dealing with the paper. For example, a bill that gives the bearer the right to delivery of a certain amount of gold allows the value of the gold to be transferred around the market without having to move the physical gold at all.

In effect, the paper provides a kind of proxy on which the law of property can fix its attention. Paper instruments are generally treated as movable tangible property. In the civilian idiom, the paper provides a "thing", a *res*, in which property rights can be held.

9 See (2019). *B2C2 Ltd v Quoine Pte Ltd.* SGHC(I) 03. Available at: **https://www.sicc.gov.sg/docs/default-source/modules-document/judgments/b2c2-ltd-v-quoine-pte-ltd_a1cd5e6e-288e-44ce-b91d-7b273541b86a_8de9f2e2-478e-46aa-b48f-de469e5390e7.pdf** [Last accessed: 10 December 2019].

Figure 4: Finding a *res* (an object of property law)



The definition of a *res* is often set out in strict terms in civilian legal systems, in the part of the civil code dealing with property rights or sometimes even in the general part. It may therefore be necessary to provide expressly that an intangible, digital representation can be recognised as an object of property rights.

Liechtenstein's value rights

Liechtenstein law has traditionally worked with paper securities (so-called "*Wertpapiere*" or "value papers"). In order for securities to be represented by a token in a "Trustworthy Technology" system and transferred within that system without the need for a physical certificate, Liechtenstein has utilised the figure of "*Wertrechte*" (literally "value rights") to create a point of interface between securities law and "Trustworthy Technology" systems. *Wertrechte* are dematerialised securities, by which the function of a certificate is replaced by entry in the so-called *Wertrecht*-register.

Wyoming amends its Uniform Commercial Code

The US State of Wyoming has recently enacted legislation that recognises digital assets as objects of property rights. The legislation sets out a schema comprising three types of digital asset, i.e. *digital securities*, *virtual currencies* and *digital consumer assets*. All qualify as *intangible personal property*, and are respectively considered as *securities*, *money* and *general intangibles*. The legislation also provides the owner of a digital asset with the option to issue a written agreement for the digital asset that is treated as a "financial asset". Under these circumstances, the asset is treated as *intangible personal property*.

Again, we can see parallel developments in different jurisdictions across the world and observe that developments with a similar functional outcome pursue paths determined by the historical structure and categories of the relevant legal system. Thus, although "all roads lead to Rome", important differences might open up between national jurisdictions in the path actually taken. Whether or not these differences cause any practical issues remains to be seen.

Recommendation 4

Further clarification may be needed from national legislatures on the legal recognition of purely digital objects to understand whether (and how) dealing with a digital token has legal consequences for real world rights. In particular whether intangible, digital representation can be recognised as an object of property rights.

Ownership and possession

The two most important concepts in the law of property are ownership and possession. While definitions differ across legal systems, generally ownership is said to be the most comprehensive right a person can have in a thing and to contain all the "limited" property rights. Possession commonly implies physical possession of a tangible thing. Although attenuated forms of possession exist (e.g. possession through a third party or constructive possession), at base the concept of possession usually refers to physical possession of a tangible asset by some person, somewhere.

Traditional understandings of both these concepts are challenged by digital assets. While it is clear that the market expects the law to treat digital assets as objects of property rights — and it is common to speak about digital assets as objects of ownership and possession — it is not always straightforward that these concepts apply to digital assets.

Mt. Gox in Japan and bitcoins as "things" capable of ownership

In the bankruptcy proceedings following the collapse of the Mt. Gox exchange, the question arose whether bitcoins were "things" capable of ownership under Japanese law. Article 85 of the Japanese Civil Code defines "things" as *tangible* and restricts the right of ownership to things. The claimant argued that an object that is capable of exclusive legal control should be regarded as "thing"; because the electronic record held across nodes of the Bitcoin network *embodies* a bitcoin, and is not merely a *record* of it, and because it is possibly an object of ownership tantamount to a thing under the Civil Code. The court recognised that exceptions exist to allow property rights to be held in other rights (such as a pledge in a right under Art. 362 Civil Code), and that special laws provide for the exclusive control of certain rights (for example the Copyright Law and the Patent Law). But it held that the test remains whether an object is (i) tangible and (ii) subject to exclusive control: bitcoins did not qualify as "things" under Art. 85 Civil Code.[10]

In legal systems like Japan and Germany, intangible objects are recognised as fitting objects for "limited" property rights, but not ownership. Other legal systems have less strict definitions of what can be the object of the right of ownership: as alluded to above, the majority of Civilian jurisdictions recognise property rights in rights, under the category *res incorporales*. There, digital assets representing rights in other assets or claims against a person might be brought into the legal system without great difficulty. Cryptoassets, on the other hand, may still pose problems.

As already mentioned, common law systems generally take a more open-textured approach that focuses more on the remedies available to the holder of a property right than to a conceptual definition of the type of thing in which property rights can be held. But here, too, innovation may be necessary if the full range of digital assets and cryptoassets is to be accommodated. It is possible that law reform will be needed to bring digital assets satisfactorily within the law of property and thereby ensure the settled application of legal rules to transactions involving digital assets. The question then arises whether this should occur through (i) judicial innovation, (ii) amendment of the basic provisions of the Civil Code, or (iii) special legislation that creates a separate regime.

10 Access the English translation of the (2015) *Mt. Gox judgment*. Oxford Digital Assets Project. Available at: **https://www.law.ox.ac.uk/sites/files/oxlaw/mtgox_judgment_final.pdf** [Last accessed: 09 December 2019].

The UK's legal approach: cryptoasset, a third category of personal property?

The LawTech Delivery Panel UK Jurisdiction Taskforce (UKJT) produced a Legal Statement in November 2019 opining that cryptoassets should be regarded as objects of property rights in English law as it currently stands.[11] However, cryptoassets do not fit neatly into any existing category of personal property: English law divides "personal property" into "things in possession" and "things in action". On this view, while digital assets that represent "offchain" rights would qualify as choses in action, cryptoassets do not fall into either category because they (i) cannot be possessed and (ii) do not represent a right. If it is necessary to specify what species of personal property cryptoassets are, the Legal Statement suggests that they should be seen as a novel, third type. The UKJT's approach was endorsed by the High Court of England and Wales in AA v Persons Unknown. Although questions remain, the details are likely to be worked out in future decisions by the English courts, bringing digital assets within the general law of property without the need for legislative intervention.

This kind of development is more difficult in civilian legal systems. Often, amendments to the code entail high "systemic costs", as the ramifications of a change might spread throughout the whole Civil Code and produce unknown consequences, impacting negatively on legal certainty. In such contexts, law reform is less likely to take place by judicial development and may, in the first instance at least, take the form of an insulated special regime rather than an amendment to the general provisions of the relevant code.

Liechtenstein's bespoke legal framework for ownership of digital tokens

In Liechtenstein law, things are defined expressly as corporeal things. According to the Liechtenstein Government's report on the Law on Tokens and Trustworthy Technology Service Providers, "application of the conventional concept of ownership would therefore not be fitting and would lead to legal uncertainty." It would in theory be possible to expand the concept of "ownership" to apply to non-corporeal objects and to declare it to be applicable to tokens. But the report indicates that it "would require a deep intervention in the law of property, as many provisions would have to be rewritten". The Government thus decided to "regulate rights in tokens and the legal consequences they entail separately. The established system of property law thus remains unaffected and a clear and comprehensible legal framework for tokens connected with Trustworthy Technology systems will be created."[12]

German exposure draft of a new law on electronic securities

A new proposal for legislation by the German Federal Ministry of Finance (released on 23 July 2020) proposes to allow electronic securities ("elektronische Wertpapiere") and to replace the traditional requirement for an immobilised global certificate through the creation of an electronic securities register. These new digital instruments will, insofar as no contrary provision exists, have the same legal consequences as paper securities. Further, and perhaps most controversially, §2(3) of the draft provides that an electronic security "counts as a thing in the meaning of §90 of the German Civil Code." This is potentially controversial because the latter provision provides expressly that "Things, within the meaning of the law, are only corporeal objects." The draft legislation thus illustrates the approach of creating a parallel regime, through a deeming provision, while leaving the basic principle of corporeality untouched.

Recommendation 5

It may be necessary and/or desirable to establish how digital assets and cryptoassets can be objects of the right of ownership in legislation in appropriate jurisdictions, whether through amendment to general provisions or the creation of an insulated special regime.

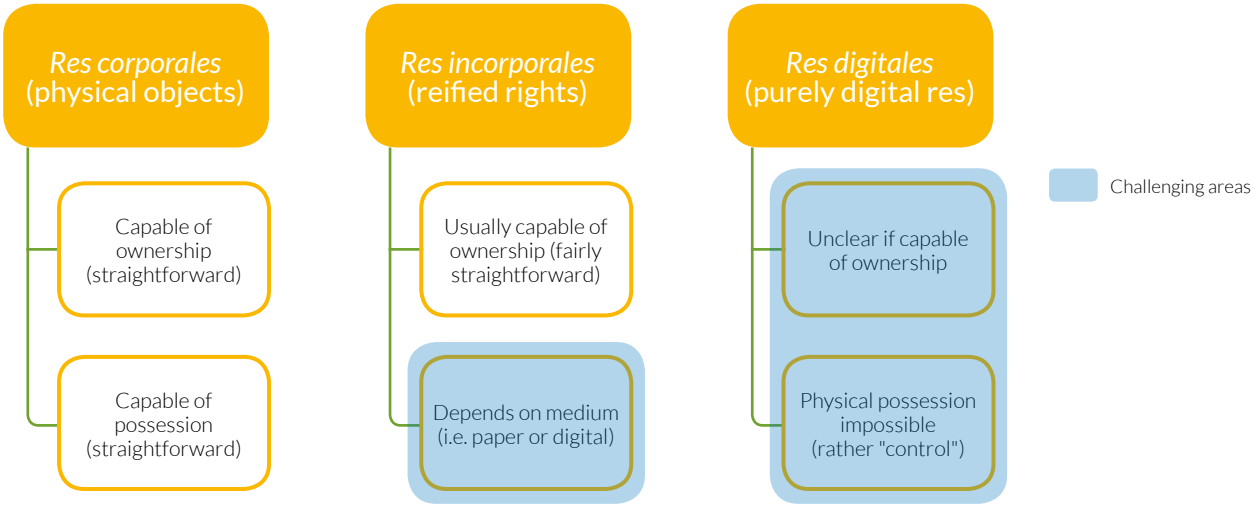
11 LawTech Delivery Panel UK Jurisdiction Taskforce (2019). Legal statement on cryptoassets and smart contracts. para. 141 and ff. Available at: https://technation.io/news/uk-takes-significant-step-in-legal-certainty-for-smart-contracts-and-cryptocurrencies/ [Last accessed: 10 December 2019].

12 LLV (2019) *Report and Application of the Government to the Parliament of the Principality of Liechtenstein concerning the Creation of a Law on Tokens and TT Service Providers and the Amendment of Other Laws.* Report and Application of the Government to the Parliament of the Principality of Liechtenstein, No. 54/2019, p.62 (translation our own). Available at: https://bua.regierung.li/BuA/default.aspx?nr=54&year=2019&backurl=modus%3Dnr%26filter1%3D2019 [Last accessed: 12 December 2019].

Possession is also important because it plays a vital role (i) in the law governing how assets are transferred and (ii) in the law governing what remedies are available to protect one's property rights in an asset. Possession is defined differently in different legal systems. Generally, civil law legal systems have more developed conceptual definitions of possession, but they also differ in terms of whether possession is said to be a purely factual or also a legal state of affairs. Common law systems generally have a less developed concept of possession, which may therefore be more flexible.[13]

However, all concepts of possession are challenged by intangible objects. The problem is quite simply that the conventional concept of possession implies physical possession. In most legal systems, then, questions will arise about the extent to which the concepts of ownership and possession can apply to digital assets and cryptoassets.

Figure 5: What *res* are capable of ownership and possession?



Some remedies unavailable for intangible objects in English law

The English law remedy of conversion, which applies when an object of property rights has been taken and used by another in a manner inconsistent with the rights of the owner, presupposes physical possession. In *OBG v Allan* [2007] UKHL 21, the House of Lords had to decide whether the remedy could apply to the intangible assets of a company under receivership. The court was divided in its opinion, but the majority held that the remedy would not apply because the element of possession could not be satisfied.

We will deal with this issue further under the rubric of *custody*, below. The conventional concept of possession cannot apply to digital assets. While possible, there are good reasons to avoid "stretching" the concept. It would be better to start from the premise of exclusive control over information in a digital ledger, and to develop appropriate actions and remedies rather than working by analogy with physical possession.[14] The details will vary depending on the details of the cryptographic or other security system utilised in a given case (e.g. knowledge of private keys controlling unspent transaction output on the Bitcoin protocol might be said to give a person "control"). This will remain an area of contention and solutions will be highly jurisdiction-specific, particularly the extent to which "control" can play the same role as possession in the mechanics of the relevant property law system.

13 See Tay, A.E.S. (1964) *The Concept of Possession in the Common Law: Foundations for a New Approach*. Melbourne University Law Review, p.476. Available at: **https://www.austlii.edu.au/au/journals/MelbULawRw/1964/17.html** [Last accessed: 10 December 2019].

14 Legal remedies are premised on physical possession; since physical possession is not suited to digital assets, a concept of "control" within a computer system would be more appropriate.

UNICTRAL Model Law on Electronic Transferable Records

The 2017 Model Law on Electronic Transferable Records (MLETR) aims to enable the legal use of electronic transferable records both domestically and across borders, and provides a model law for national legislatures. The MLETR applies to electronic transferable records that are functionally equivalent to transferable documents or instruments. Transferable documents or instruments are paper-based documents or instruments that entitle the holder to claim the performance of the obligation indicated therein and that allow the transfer of the claim to that performance by transferring possession of the document or instrument. The MLETR recognises that electronic records cannot be possessed in this way, and substitutes the concept of control for possession: an electronic transferable record is functionally equivalent to a transferable document or instrument if that record contains the information required to be contained in a transferable document or instrument, and a reliable method is used to: (a) identify that electronic record as the electronic transferable record; (b) render that electronic record capable of being subject to control from its creation until it ceases to have any effect or validity; and (c) retain the integrity of that electronic record. Control is a fundamental notion of the Model Law since it represents the functional equivalent of possession of a transferable document or instrument. In particular, the possession requirement is met with respect to an electronic transferable record if a reliable method is used to: (a) establish exclusive control of that electronic transferable record by a person; and (b) identify that person as the person in control.

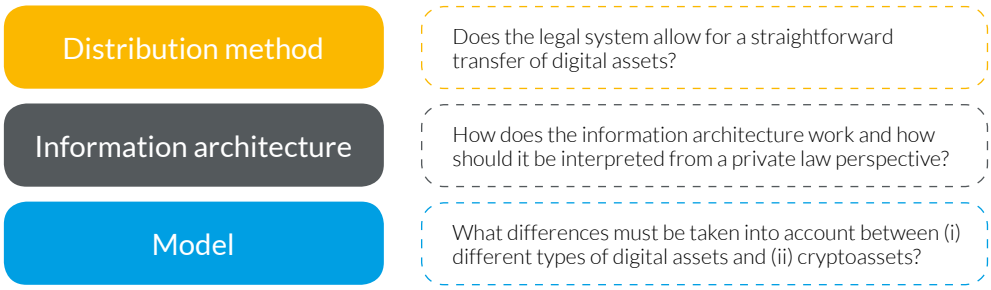
Dealing with title to digital assets

Transfer of title

Assuming that property rights (up to and including ownership) can be held in digital assets, how is title to digital assets transferred? Consistent with the view that CCAF has adopted to the characterisation of DLT-based systems,[15] transfers of title occur by means of updating the relevant ledger, which is more analogous to existing systems for things like uncertificated (dematerialised, scripless) securities than to transfers of cash, which involve a change of physical possession.

As the ledger system provides the legal "bridge" between the token and the rights underlying, it will be necessary to examine tokens on a case-by-case basis to determine whether legal requirements, such as requirements for form, follow the digital token (**Figure 6**).

Figure 6: Transfer of title



In this context, novel information systems (e.g. blockchains and DLT systems) might have to interact with existing systems of registration (e.g. of scripless shares or real estate). In the context of real estate, in particular, many legal systems impose rules of formality and procedure that will need to be satisfied.

15 Cambridge Centre for Alternative Finance (2018) *Distributed Ledger Technology Systems: A Conceptual Framework*. Available at: **https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/distributed-ledger-technology-systems/** [Last accessed 19 December 2019].

The legal recognition of DLT-based minibonds in France

Some provisions of the French Commercial Code and the French Monetary and Financial Code have been amended to enable the issuance and disposition of mini-bonds (sub-category of short-term notes which facilitate the access of SMEs to funding via crowdfunding platforms), and the registration and transfer of dematerialised transferable securities using a DLT system. To comply with European law, this amendment only applies to equity securities and debt securities that are not traded on a trading venue, negotiable debt securities, and units or shares of collective investment. The amended law legally recognises the use of electronic registration devices, including distributed ledger registers, for the registration and transfer of dematerialised securities. The amended article specifies that registration through an electronic registration device does not impact the fungibility of concerned securities. However, the amended law does not provide for the issuance of securities: it only relates to their holding and circulation. The security will be represented by a "token", considered as an "electronic asset", on the electronic register. Like other instruments (e.g. paper security), the token acts as a proof of holding the security, but does not guarantee the validity of the security.

Recommendation 7

If a digital token were issued to represent assets subject to requirements of form, the asset ledger would have to inter-operate with the relevant official register in order to ensure that rights could be transferred effectively by transferring tokens on the asset ledger. This might be achieved by means of a special provision. Generally, it would be necessary to ensure that the ledger satisfied all of the formal requirements (e.g. for writing, signature, etc.) for the transfer of property rights in the underlying asset, and it would probably be necessary to ensure that the competent official had some privileged access to the digital asset ledger.

Custody of digital assets

Many forms of financial intermediation involve the intermediary holding custody of financial assets. It is commonly assumed that having control over private keys in a public-private key cryptographic system is accurately described as "custody", but, given the impossibility of traditional possession of intangible objects, important questions arise in the context of relationships described as "custodial". From a legal perspective, other concepts, such as "control", could provide an alternative to possession (e.g. involving storage of private keys).

ESMA and UKJT's approach to the possession of digital assets

In January 2019, the European Securities and Markets Authority (ESMA) published an Advice on ICOs and digital assets. The Advice notes several difficulties with the custody of digital tokens, and takes the preliminary view that having control of private keys on behalf of clients could be the equivalent to custody/safekeeping services, and the existing requirements should apply to the providers of those services.[16]

The UKJT takes the position that bailment (i.e. the temporary transfer of possession, but not ownership, of an object by one person to another) is impossible in the case of digital assets. Bailment, by its nature, requires the transfer of possession. Digital assets cannot, on this view, be the subject of a bailment, and this will bear on the range of custodial arrangements possible under English law.

The complexities of custodianship, property law, and the "dematerialisation" of financial assets is well known. In intermediated arrangements, there is often a separation of possession/control and ownership, or, in some systems, between so-called "legal" and "beneficial" or "economic" title. Often, property rights

16 ESMA (2019) *Advice on Initial Coin Offerings and Crypto-Assets*. ESMA 50-157-1391, para. 172. Available at: **https://www.esma.europa.eu/sites/default/files/library/esma50-157-1391_crypto_advice.pdf** [Last accessed 10 December 2019].

in a financial asset are functionally replaced by obligational rights against an intermediary in complex, layered structures. These structures can become particularly difficult on events such as insolvency, and in the cross-border context. Some of these issues will be revisited in **Section 3**.

Good faith acquisition (negotiability)

All legal systems recognise certain situations in which a transferee of property gets good title, even if there was a defect in the title of the transferor. This is often referred to as a regime "good faith acquisition" (e.g. German law) or "negotiability" (e.g. French law, English law). These regimes represent an exception to the general rule that *nemo dat quod non habet* ("no one gives what they don't have").

It is not uncommon to read that digital tokens are, or should be thought of as, "digital bearer instruments".[17] Such claims seem motivated by a desire to ensure that a good faith acquisition regime operates for digital assets. Such claims work by analogy with the functional predecessor of digital assets, i.e. paper-based financial instruments. While it is fair to argue that a bitcoin, or any other digital asset, should be able to pass free and clear to a transferee, even when the transferor did not have good title, it is inappropriate to talk about any digital assets as "bearer instruments".

Digital asset negotiability under the US Uniform Commercial Code

The US Uniform Law Commission, which drafts the Uniform Commercial Code, has recommended amendments of Articles 8 and 9 of the UCC which are in the process of being taken up by US states.[18] Under the suggested approach, "cryptocurrencies" are to be treated as "general intangibles" under Article 8, as are digital assets comprising "security interests" under Article 9. On the approach suggested in Article 8, "virtual currencies" held by an intermediary are negotiable (the UCC draft uses the term "super-negotiable"), but those held directly are not negotiable. The US State of Wyoming has been one of the first States to respond to these amendments, but the legislation enacted in Wyoming takes a broader approach. Wyoming law has opted to treat "virtual currencies" as money (i.e. negotiable), while other classes of digital assets (i.e. digital consumer assets and digital securities) are not negotiable. Under Wyoming law, security interests in digital assets depends on a test of control, and the transferee of a digital asset takes it free and clear of prior adverse claims after two years provided that they took it for value and did not have actual notice of the prior adverse claim. The essential difference in the approach is that the Wyoming law provides for good faith acquisition of directly-held digital assets whereas the Uniform Law Commission's amendments do not.

Caution is warranted when using the language of negotiability, because conventional negotiability law requires, or rather presupposes, an instrument that can pass in physical possession. To this extent, "negotiable digital assets" involves a confusing analogy between digital and paper "tokens" and could prevent the orderly development of a good faith acquisition regime tailored to digital ledger entries.[19] In the context of a register-based system, good faith acquisition generally means that changes to the ledger are "indefeasible" evidence of a change of legal entitlements. [20]

It may be possible to provide for the application of existing laws to digital assets by analogy. However, where such a *"mutatis mutandis"* approach is desired for digital assets, it will be vital to work out how provisions intended for tangible assets actually operate over them.

17 For example see Shearman & Sterling LLP, R3 and BAFT (2018) *Code Is Not Law: The Legal Background for Trade Finance Using Blockchain*. Available at: **https://www.r3.com/wp-content/uploads/2018/07/Code_Is_Not_Law_R3_2_3.pdf** [Last accessed 10 December 2019].

18 See UCL (2018). *Supplemental Commercial Law for the Uniform Regulation of Virtual-Currency Businesses Act*. Available at: **https://www.uniformlaws.org/committees/community-home?communitykey=fc398fb5-2885-4efb-a3bb-508650106f95&tab=groupdetails** [Last accessed: 27 November 2019].

19 See Allen, J. G. (2019) *Negotiability in Digital Environments*. Butterworths Journal of International Banking and Financial Law, p.459.

20 Meaning not subject to being lost, annulled, or overturned by a countervailing legal interest.

Recommendation 8

A good faith acquisition regime should be developed and tailored to digital assets where it is desirable that the transferee of a digital token should get clear title even when there are defects in the title of the transferor, as is generally the case with many other financial assets and with money. In our view, it is important to accurately describe what actually occurs: a ledger is being changed, and the changes are taken to transfer legal title as between the users of the system. While this can be treated as analogous to a change of possession, in reality there is the destruction of one ledger entry and the creation of a new one, and indefeasible legal consequences are being attributed to this change of the ledger.

A related question in civilian legal systems is whether a regime of acquisitive prescription or extinctive prescription should operate in the context of digital assets.[21] The main problems are by now familiar: first, the conventional rules of acquisitive prescription generally require physical possession; and secondly, some civilian systems may not recognise the right of ownership in digital assets at all.

Encumbering title to digital assets

Assuming that digital assets are fitting objects of property rights, up to and including ownership, what specific property rights can be held in digital assets? Specifically: what property rights can be held by persons other than the owner?

Legal systems generally recognise use rights and security rights that have the effect of encumbering the title held by the owner. If ownership is the most comprehensive right that a person can have in a thing, use rights and security rights can be conceptualised as "fragments" of the right of ownership that restrict the otherwise plenary rights of the owner.[22] Generally, each of these property rights is restricted to certain categories of assets.

German law pledges over company shares

Under the German Civil Code, company shares can be made the subject of a pledge, but the creation of the pledge differs according to the type of share: In the case of certificated (i.e. paper) shares made to bearer, the creation of a pledge follows the rule for movable things in § 1273. This requires (i) agreement, and (ii) the delivery of possession of the certificate or a surrogate. Certificated named shares follow similar procedures, with differences according to whether or not they have been endorsed. The majority of opinion holds that (i) agreement, and (ii) delivery of possession is also the procedure for shares issued under a global (immobilised) certificate. The minority opinion holds that the provisions governing pledges over rights should apply here. For uncertificated shares, a pledge is created by contractual agreement following the procedure in § 1274, § 398 and § 413.

Some obligational relationships are similar in certain respects to security rights. These include the rights of sale and leaseback, factoring, hire purchase, retention of title, and guarantees. Another category comprises rights arising under a trust. Common law legal systems allow ownership of an asset to be "split" between a so-called "legal owner" and a "beneficial owner" in the context of a trust or a trust-like relationship.[23] Trusts generally require certainty of subject matter, which can be problematic in the case of digital assets in systems where their status as property is unclear.

21 In civilian legal systems, this generally derives from the Roman law of "usucaption" (acquisition of a new right of ownership) and "prescription" (extinction of an existing right of ownership).

22 Examples of such "lesser" property rights include mortgages, hypothecs, usufructs, superficies, charges (including "floating charges"), and pledges. French law, for instance, conceptualises "ownership" as composed of all the rights of "usus", "fructus", and "abusus".

23 A beneficial owner is a person who enjoys the benefits of ownership, even though the title to some forms of property can be in another name. Examples include a company which has title to an asset, but the shareholders of the company are the beneficial owners, an account holder at a financial institution as well as the beneficiaries of a trust, where the trustee has title to the underlying assets. It also can mean any individual or group of individuals who, either directly or indirectly, has the power to vote or influence the transaction decisions regarding a specific security, such as someone who controls transaction execution on a brokerage account.

The trust is often regarded as inconsistent with the absolute conception of ownership prevalent in civilian legal systems, and some systems are unwilling to recognise the rights of a trust beneficiary as property rights at all. Other legal systems are more open to the recognition of property rights arising from trusts.

A digital asset platform is expected to conform to the relevant legal system's approach to the encumbrance of title to assets and find an appropriate way to (i) record the existence of encumbrances, and (ii) allow parties to enforce them. In a register system with a good faith acquisition regime, it will be essential to allow for encumbrances to be registered within the system.

Encumbrances that are not duly registered should, on this approach, not follow the asset once it changes registered owner. This is analogous to title registry systems for land such as the Torrens systems of land title (e.g. Australia). In Torrens systems, registered title is said to be indefeasible to non-registered encumbrances, such that the transferee will get title to the asset free and clear of prior adverse claims. Originally, indefeasibility was intended to be absolute in Australia and a title deposit insurance scheme was launched to compensate victims of fraud. In many such systems, however, exceptions also exist to protect the beneficiaries of trusts and the victims of fraud if certain conditions are met—in many cases, carried over from the older law. In register systems for financial assets, in which the "negotiability" of financial assets is paramount, it would seem desirable to keep such exceptions to a minimum.

Remedies: solving disputes about entitlement to digital assets

Property law is distinguished by the availability of remedies that generally have effect "against all the world" to vindicate the property rights. Importantly, entitlement to the remedy follows the object of the relevant property rights: it is not personal to the (first) owner. [24]

Remedies are particularly important in cases where title to an object is disputed, for example following a purported transfer of title or in an insolvency situation where the assets of a company are to be applied for the benefit of creditors rather than the owners of the company.

Remedies availability: examples from Japan and the UK

In the Mt. Gox bankruptcy proceedings referred to earlier, the claimant argued that bitcoins were "things" capable of ownership so that he could get a proprietary remedy, namely the delivery of the bitcoins, rather than having a claim as an unsecured creditor for the value of the bitcoins at the time Mt. Gox became bankrupt. As the court held that bitcoins could not be owned, this remedy was not available.

As we have seen, the UK Jurisdiction Taskforce, the Singapore Court of Appeal, the High Court of England and Wales and the New Zealand High Court have all taken the position that bitcoins are objects of property for purposes such as this.

Civil law systems distinguish between so-called "petitory" and "possessory" remedies. Stated generally, the former (including the action of "vindication" for delivery of the asset) protect the owner's title, while the latter protect the rights of one in possession. As the Japanese example has shown, petitory actions may raise problems in certain civilian jurisdictions.

Recommendation 9

If digital assets are recognised as fitting objects of the right of ownership, petitory remedies (i.e. protection to the owner's title) should be available to restore control over the asset to its rightful owner, rather than possessory remedies (i.e. protect the rights of one in possession).[25]

24 In this sense, they are rights *in rem* rather than rights *in personam*.

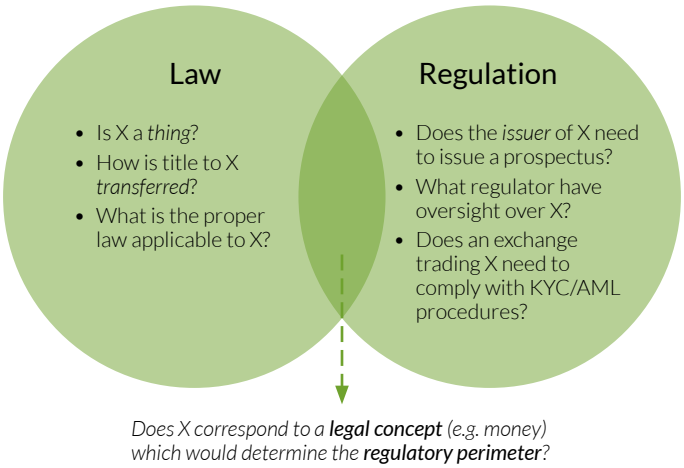
25 See Carr, D. (2019) *Cryptocurrencies in the Common Law of Property*. Cryptocurrencies in Public and Private Law, sect. 7.30

2.2 The Law and Regulation of Socio-Technical Systems

Law and regulation

It is not always possible to draw a bright line between "legal" and "regulatory" questions, especially when legal concepts define an authority's regulatory perimeter.[26] In practice, questions are often approached from the perspective of regulation before they are addressed at the level of legal concepts.

Figure 7: Defining the legal object of regulation



To the extent possible, it is important to separate legal and regulatory questions, and to direct attention to the legal ones first. In practice, this may require a reflective, iterative process where regulatory questions (under the existing law) are addressed but attention is also given to the more fundamental legal questions that digital assets present (e.g. the definition of what can be a fitting object of property rights).

This next section focuses on how a legal system responds to new economic practices that are enabled with novel technology (e.g. the "tokenisation" of rights) and how the legal system actively utilises new technologies to effect legal operations. As the legal commerce of financial assets generally consists in the maintenance of records of changing property rights, this entails an examination of the interaction between information repositories and the law.

What role does a ledger play in a legal system?

In ledger, registry, and account-based systems, the entry of information into an official information repository plays a *constitutive* role in the creation of a financial asset, and provides an environment in which operations with assets can be carried out.[27]

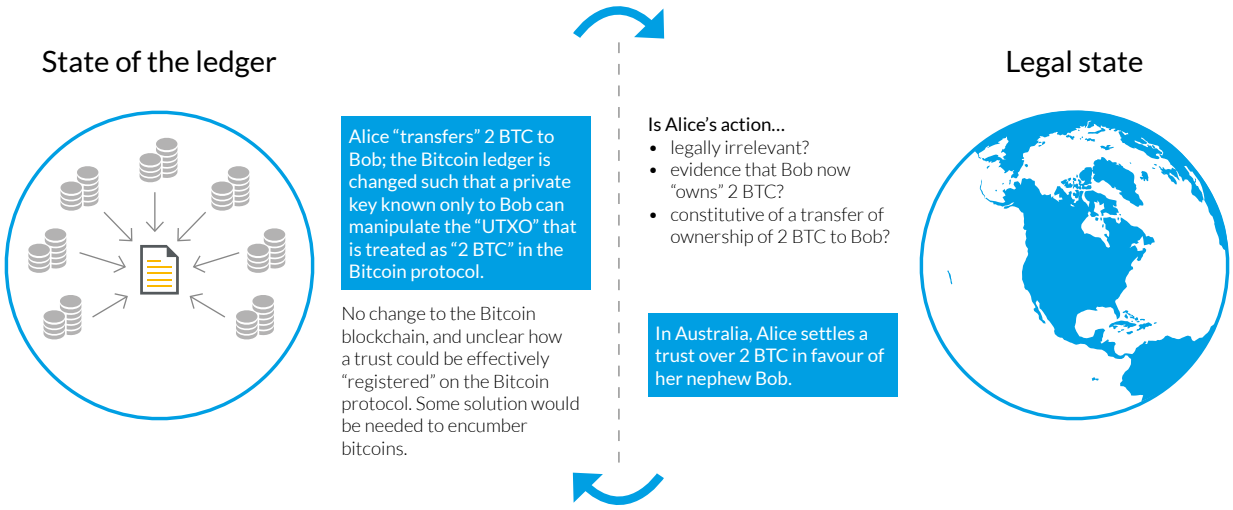
In the traditional model, a central counterparty is authorised to maintain the relevant register which (i) records, and thereby (ii) constitutes or effects legal transactions. The counterparty has the legal duty to ensure that the register is accurate (i.e. reflects the legal position at the relevant time) and that all changes to the register are made in accordance with the law. The central counterparty thus provides a target for regulation and for legal remedies, such as court orders to modify the register as parties' legal rights are determined according to legal process.

26 The definition of "money" provides an example: the legal concept of money is notoriously difficult, yet it determines the oversight role in the regulation of financial institutions like central banks.

27 For example, in English law a share is created when an entry is made into the relevant register of shareholders and transfers of shares are effected when that entry is amended (i.e. the asset represented in the register is associated with a new user identity).

This model developed with the legal system over centuries, so generally the operations performed within a centralised information repository translate directly to changes in the legal position of the parties involved. In the case of novel information systems, such as DLT-based systems, the question then arises what effect they are to have in the "world of law".

Figure 8: State of the Bitcoin ledger and legal state



To the extent that e.g. a trust is valid, the Bitcoin ledger can only be evidence of a change of title, but not dispositive of such a change. If the legal effect of the trust is to be ensured, it would thus appear necessary to supplement the Bitcoin ledger in some way to prevent inconsistent dealings or to reverse transactions on the Bitcoin ledger that are inconsistent with the beneficiary's rights. In such a case, it may be necessary to implement some custodial holding regime, such that the BTC are held by the custodian within a closed system and the trust is registered by the custodian and prevents inconsistent dealings with the BTC within the closed system. However, this represents a major departure from the notion of a fully decentralised information repository.

It is worth noting that this primarily applies to open and permissionless DLT systems with no central operator. In the case of digital asset platforms that operate in a regulated environment, vetted identifiable actors run the infrastructure and have adequate remedies at their disposal to ensure that ledger state and legal state are synchronised and do not conflict.

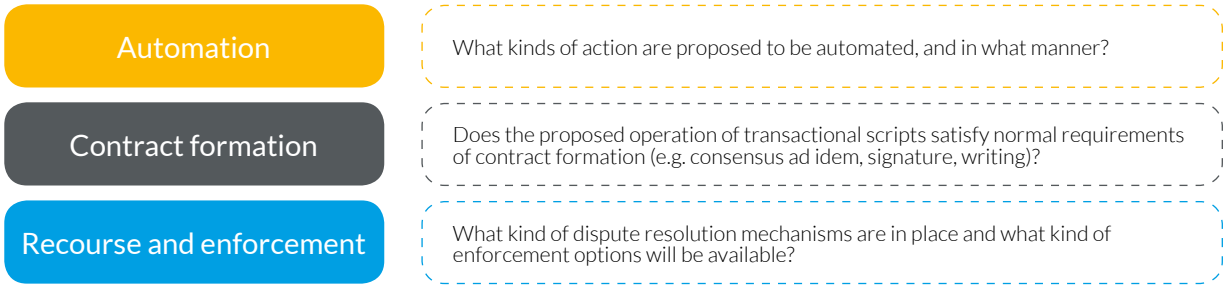
Transactional scripts and "smart contracts"

The legal characterisation of computer code that (i) records, and (ii) effects legal operations (e.g. transfer of title) is currently unsettled. There is a general recognition that the law should follow the intentions of market participants, and certain jurisdictions have taken decisive steps to recognise the legal validity of contractual arrangements recorded in whole or in part in code rather than prose.

Contractual interpretation of smart contracts in the UK

The UK Jurisdiction Taskforce's Legal Statement takes the position that there is no reason why the normal rules should not apply just because a potential contract is a "smart contract". The question of whether, and under what circumstances, a smart contract is capable of giving rise to binding legal obligations turns on the question of whether, and under what circumstances, parties engaged in smart contracting are capable of satisfying the ordinary requirements for contract formation in English law: of reaching objective agreement as to terms, of intending to create a legally binding relationship, and of satisfying the requirement of consideration. As "smart contracts" differ significantly in their implementation, and particularly with regards to the *automaticity* of their performance of contractual obligations, this requires a case-by-case analysis. Difficulties may arise in the context of contract interpretation, as the rules of interpretation are based on natural language. Interpreting the parties' objective intention at the time of contract formation remains the central task for judges considering the legal effect of a smart contract.[28]

Figure 9: Transactional scripts and "smart contracts"



The law governing "smart contracts" is in its early days and still developing. Questions surrounding their legal status and enforceability, interpretation, technological best practices, and dispute resolution systems will all be spaces to watch. In all cases, it is desirable to identify with precision what role transactional scripts are playing in the digital asset trading system and to be vigilant as to the transactional and systemic risks they may present.

Desirable features: immutability, probabilistic settlement finality

The automaticity of smart contracts, and the "immutable" nature of DLT-based information repositories, will raise difficulties in certain circumstances.[29] The ledger can potentially be "forked", but that carries with it a whole raft of further questions including how the fork is achieved; often, the forking process itself is highly informal and depends on the willing cooperation of a majority of the "nodes" participating in the protocol that creates the ledger. In general, it is fair to say that forking, on its own, is not an adequate replacement for conventional corporate governance, investor protection, or financial stability regulation. Again, the possibility of a fork may even be at odds with the philosophical justifications for maintaining a distributed, rather than a centralised, ledger. Further, there may be significant procedural issues in making a court order against a user of such a network; many of the protocols concerned allow users to transact using pseudonyms, and so-called "privacy coins" may guarantee a high level of anonymity.

This raises the question to what extent DLT technology and smart contracts are appropriate to the needs of a *legal* information repository. The idea of immutability may be attractive for its tamper-proof quality, but to the extent that a digital asset platform is meant to provide a context for the transfer of legal rights, the characteristic of "absolute" immutability is actually undesirable. In other words, it is a desirable feature for legally invalid transactions to be unwound: an immutable information repository is

28 LawTech Delivery Panel UK Jurisdiction Taskforce (2019). *Legal statement on cryptoassets and smart contracts*. para. 141 and ff. Available at: **https://technation.io/about-us/lawtech-panel/** [Last accessed: 10 December 2019].

29 For example, consider the case where A "transfers" BTC to B, and C claims that A used the private key unlawfully, or where a BTC transaction was based on a mistake or accident. A court could make an order that B should "transfer" the BTC back to A, but there is no way to simply "unwind" the transaction, i.e. reverse the changes made to the distributed ledger.

too rigid to interoperate effectively with the legal system. While tamper-proofness is most important in a decentralised system, (semi-) centralised information repositories rely on trusted parties to prevent the ledger being tampered with. If a DLT system is adopted for a digital asset platform, it will be necessary to ensure technical means to enable the reversal of certain dealings with digital assets on the platform.

Finally, some DLT systems can only provide probabilistic settlement finality, where there is a chance of transaction reversal due to the nature of the consensus model. However, in line with the aforementioned potential challenges, it is largely a feature of open and permissionless blockchains such as Bitcoin and Ethereum. This attribute is not an issue for private and permissioned DLT systems such as Hyperledger Fabric and R3 Corda whose designs cater for absolute settlement, as typically needed for enterprise solutions.[30]

Jurisdiction, territoriality, and private international law issues

A jurisdiction is a context, often defined by reference to geographical coordinates, in which a set of rules applies, and a set of institutions is authorised to enforce those rules. But objects, events, and actions based in cyberspace are sometimes difficult to bring under the framework of a (national) jurisdiction. Jurisdiction is itself often complex, with international, supra-national, regional, and sub-national institutions exercising law-making and law-enforcing authority over things like financial activity. Increasingly, national legal regimes are interacting with "soft law", standards, and self-regulatory frameworks within and across jurisdictions.

This provides challenges and opportunities: on the one hand, models like "multi-level governance" and self-regulation offer new approaches to providing the legal and regulatory framework for areas like digital assets.[31] On the other hand, there is still a mismatch between the transnational nature of financial capital (and "cyberspace") and the national interest in ensuring healthy markets, such as financial stability and consumer protection.[32]

Conceptually, technologies like the Internet and DLT are hard to locate: they appear to create a parallel domain that is non-jurisdictional in nature. Practically, cyberspace provides opportunities to engage in practices that affect national jurisdictions but are difficult to supervise and regulate using conventional means.

Because relevant actions and events may take place outside the jurisdiction, certain digital asset platform designs might entail an extension of national jurisdiction over actors and objects located abroad. Questions then arise as to how this will be justified, limited, and enforced. This may require custodial solutions, restrictions on international investment, or on the trading of digital assets that cannot easily be subjected to local law. Notions of personal jurisdiction may be important (e.g. based on consent) to ensure jurisdiction, governing law, and procedural efficacy are certain.

Choice of law over digital assets

These issues are particularly important in the context of property law, as discussed above. So-called choice of law rules determine when the rules of another jurisdiction apply to a dispute that is litigated in the local courts. Choice of law rules are complex, jurisdiction-specific, and also highly fact-specific. In broad terms, they often give parties to a contractual arrangement some room to determine the law that should apply to their relationship, but because property rights affect the position of persons other than the parties to the contractual relationship, the choice of law rules that apply when property rights are in dispute generally give less importance to the parties' agreement about choice of law. The focus is instead on the classification of the type of property involved and the types of rights held in it. Again, the inappropriateness of the conventional concept of possession can complicate the analysis, as it is difficult

30 For a description of the issue in more detail see: **https://www.forbes.com/sites/richardgendalbrown/2019/11/22/when-final-isnt-actually-final-cracking-blockchains-consensus-conundrum/#6180209f6040**

31 See Cottier, T., Jackson J.H. and Lastra, R.M. (2012) *International Law and Financial Regulation in Monetary Affairs*. International Economic Law Series. p.413, p.415, and ch. 8.

32 See generally Allen, J.G. and Lastra, R.M. (2020) *Border Problems: Mapping the Third Border*. Modern Law Review. [forthcoming].

to say where, for example, a bank account balance is located where a banking system extends across jurisdictions.[33]

Where a digital asset system involves a central counterparty, it may be easier to determine the applicable law. Truly decentralised systems, on the other hand, will likely cause significant problems for the application of existing choice of law rules.

Addressing private international law issues through international cooperation

The UKJT Legal Statement suggests that legislation may be necessary to resolve the international private law issues raised by digital assets, "most likely following international cooperation." In the meantime, it suggests that the most important considerations to connect a dispute relating to digital assets to a legal system include (i) whether any off-chain asset is located in the jurisdiction, (ii) whether there is any centralised control in the jurisdiction, (iii) whether a particular digital asset is controlled by a particular user in the jurisdiction, and (iv) the law applicable to the relevant transfer (e.g. the parties' choice of law in the contract by which title is transferred).[34] Currently, a joint project of the UN Commission on International Trade Law and Unidroit is addressing emerging technologies including cryptoassets and DLT. Such efforts are highly valuable in achieving a harmonised response to a transnational phenomenon.

33 See e.g. Sommer, J.H. (1998) *Where is a Bank Account?*. 57 Maryland Law Review 1. Available at: **https://heinonline.org/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/mllr57&section=8** [Last accessed: 10 December 2019].

34 LawTech Delivery Panel UK Jurisdiction Taskforce (2019). *Legal statement on cryptoassets and smart contracts*. para. 99. Available at: **https://technation.io/about-us/lawtech-panel/** [Last accessed: 10 December 2019].

3

Activities in the Digital Asset Ecosystem

Section 3: Activities in the Digital Asset Ecosystem

This section introduces a simple and generic classification model developed by CCAF to examine the different ecosystem activities surrounding digital assets. On the basis of this classification, the section analyses how these activities may differ, in terms of processes and functions, from those that can be found in traditional financial markets, and expands on the potential legal and regulatory ramifications.[35]

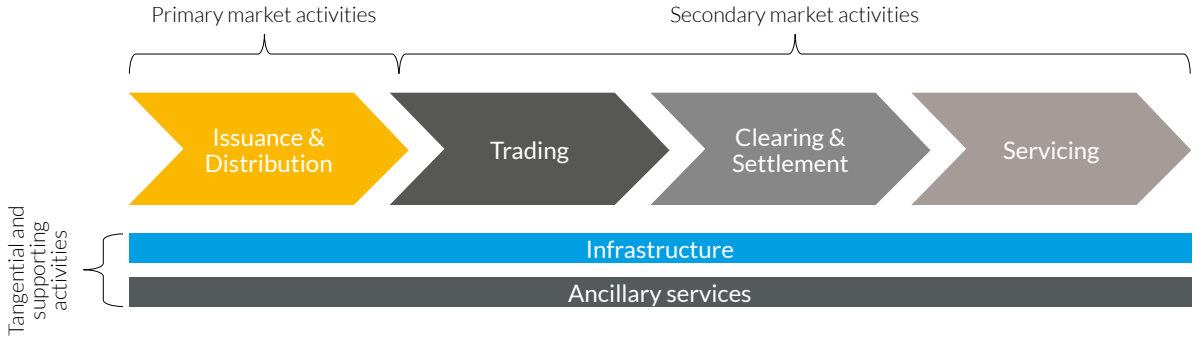
3.1 Introduction

As has been discussed elsewhere,[36] the emergence of digital assets provides potential advantages to market participants (e.g. enhanced workflow efficiencies, greater transparency, automated lifecycle management, new forms of custody), but may also challenge existing functions and responsibilities. While it is expected that the fundamental nature of most of the activities found in traditional capital markets will remain the same, significant changes in existing models will require the development of new infrastructure and technical skills. Furthermore, the technological dimension of digital assets has already led to the creation of entirely new roles and activities (e.g. cryptoasset mining).

Incumbents will have to adapt to these changes by upgrading existing infrastructure and processes, handling new end-to-end workflows, and/or assuming a fundamentally different role. In addition, incumbents will likely face pressure from new entrants that are not bound by legacy processes and technical debt. These changes will have legal and regulatory implications for actors that will have to be taken into consideration when adjusting their role profile.

This evolving landscape can be analysed by organising activities across the traditional asset value chain and typical lifecycle stages. The lifecycle of a digital asset can be divided into four high-level stages (**Figure 10**).

Figure 10: The typical lifecycle of a digital asset can be represented in four main phases



35 It should be noted that what follows is not jurisdiction-specific, but can be more broadly applied to most regulatory environments.

36 See for instance ASIFMA (2019) *Tokenised Securities – A roadmap for Market Participants and Regulators*. Available at: https://www.asifma.org/wp-content/uploads/2019/11/tokenised-securities-a-roadmap-for-market-participants-final.pdf [Last accessed: 04 December 2019].

3.2 Primary Market Activities

Primary market activities relate to the issuance and distribution of assets. These consist of, but are not limited to, issuer and investor onboarding, deal structuring, risk assessment, asset registration, and distribution of the asset to market participants.

The impact of digital assets on existing activities is generally a product of the underlying technology, which may potentially introduce new primitives that can significantly alter existing business processes and functions. In the primary market, activities related to the **issuance** and **registration** of assets will predominantly be impacted.

Table 4: Primary market activities and actors

Strongly impacted activities

Activity	Description	Actor(s)	Incumbents	New entrants
Underwriting	Offer structuring, risk management, risk mitigation and book building on behalf of the issuer.	Underwriter, Investment bank	Goldman Sachs, J.P. Morgan	*New entrants generally undertake these activities under the same roof*
Issuance	Definition of asset nature and form, assessment of the suitability of the asset to be issued, and issuance to market.	Asset issuer	Morgan Stanley, Deutsche Bank	
Depository	Secure storage and safeguarding of the tangible or intangible underlying of (digital) assets.	Central security depository, Warehouse	Euroclear	Harbor, Polymath, Tokeny, Stokr
Distribution	Initial offering of the asset, including investor onboarding. Sometimes also part of the underwriting.	Selling agent	Citigroup	SE Digital, Binance Launchpad
Registration	Maintenance of up-to-date records of asset holders.	Registrar, Transfer agent	DTCC	

At the issuance stage, a different set of technical skills and expertise based on the underlying platforms and protocols will be required. Collaboration with an asset tokeniser (see *Infrastructure* subsection) is expected to take place, whereby the asset tokeniser would be responsible for initialising and executing a smart contract that established ownership and defines the terms encoded in the digital asset on behalf of the issuer.

Meanwhile, traditional forms of **registration** (i.e. nominee, registrars) risk being displaced by the use of a shared recordkeeping system, which will automatically register ownership and transfers, and be accessible to all trade participants. These changes may call into question specific obligations and requirements outlined in existing regulations (e.g. a physical register required as the primary or secondary register).

Table 5: Legal and regulatory considerations for primary market activities

	Legal considerations	Regulatory considerations
Issuance	• How is the token constructed? • What word-based legal instruments and code-based technology are used? • Is a token recognised as a legal object fitting property rights? [37] • Is the token (i) evidence of title in something else, or (ii) treated as an object in its own right? • What encumbrance the digital asset platform recognise, enable, ignore, and prohibit [38] • What are the cancellation/reissuance of digital asset procedures? • What form will the transaction for proceeds take (e.g. non-fiat payment) and what would be the associated regulatory ramifications?	• What regulation does the issuer need to comply with? • Does the issuer have to issue a prospectus? • What additional documentation is needed for the distribution of digital assets (e.g, underwriting/purchase agreement, limitations on classes of investors)? • What is the legal relationship between these documents and the smart contract? • Are there stricter requirements for the distribution of digital assets? • How are these requirements checked, and if necessary, enforced? • How will the due diligence process evolve to account for new technical features and risks? • Are there increased risks that would trigger additional AML / KYC requirements?
Registration	• Are electronic registers recognised as legally valid? • Are changes to the ledger (i) irrelevant, (ii) evidential, or (iii) dispositive of a change in the legal position of parties? • What technical operations on the digital asset platform might constitute legal	• Does a digital asset register meet the registration requirements as provided by law?

37 To the extent that a digital asset platform is meant to be an environment in which the ownership (and other property rights) in digital assets are traded between economic agents, it is necessary to ask how the applicable law treats those digital assets as objects of property rights. This question is intended to help actors engaged in the building of a digital asset platform ensure legal certainty and the proper functioning of the platform as a system that not only manipulates numbers in a database, but also brings about changes in the legal position of the relevant parties.

38 Besides ownership, other property rights or interests might be necessary, desirable, or undesirable in a digital asset platform. For example, I might want to encumber my digital assets with a security right in favour of my creditor. This question is intended to help actors engaged in the building of a digital asset platform establish system that ensures legal certainty—the protection of legal rights, on one hand, and the finality of transactions, on the other. Please consult paragraphs under "Encumbering title to digital assets" in **Section 2** which provide a comprehensive analysis on encumbrance.

Example from abroad: Switzerland

After the publication of guidelines regarding digital asset issuance by the Swiss financial regulator (FINMA), the Swiss Federal Council initiated work to amend nine federal acts to increase legal certainty for actors dealing with digital assets.[39] Switzerland's authorities have taken the approach of adapting existing laws to digital asset activities whenever possible, rather than introducing a bespoke legal framework. In large part, this illustrates the existing legal framework was "well suited" for new technologies such as DLT To supplement the efforts of regulators and legislators, the Swiss industry association for digital assets, the Crypto Valley Association, released a non-binding note to provide guidance to digital asset issuers for the tokenisation of financial assets (e.g. company shares, bonds, participation certificates, cooperative membership) and develop best practices in areas that have not yet been addressed by regulators.[40] For instance, the guidance details the obligations tokenised bonds issuers will have to abide by (e.g. requirement of a register, prospectus requirements) and draw attention to potential security issues (e.g. security breaches) and regulatory limitations. This overall approach is due to be reviewed by the Swiss parliament in early 2020.[41]

3.3 Secondary Market Activities

Secondary market functions comprise pre-trade, trade, and post-trade processes, which generally refer to the following activities:

- **Trading:** includes asset listing, price discovery, and order matching;
- **Clearing and settlement:** ensure the correct settlement of trades while limiting counterparty and default risk; and
- **Servicing:** consists of the provision of operational and administrative services (e.g. corporate actions) as well as asset custody.

Table 6: Trading activities and actors

Category	Activity	Description	Actor(s)	Incumbents	New entrants
Trading	Exchange	Venue for buyers and sellers to exchange assets, also responsible for asset listing and facilitating price discovery.	Exchange venue	New-York Stock Exchange (NYSE)	Archax
	Brokerage	Arranging trade by bringing buyers and sellers together on a commission basis.	Broker	Charles Schwab	Coinbase
	OTC services	Facilitating trade taking place outside of a formal trading venue.	OTC broker		Cumberland
	Market making	Providing liquidity to the markets by buying and selling securities at publicly quoted price.	Market maker	Shore Capital Markets	Galaxy Digital

Although the fundamental nature of **trading** activities will most likely remain unchanged, critical legal and regulatory considerations may arise (**Table 7**). This seems to be validated by observations that regulatory authorities in several jurisdictions have sought to clarify the regulatory treatment of businesses engaged in the trading of digital assets: for instance, the *Global Cryptoasset Regulatory Landscape Study* published by CCAF in April 2019 found that of 23 surveyed jurisdictions, all had issued guidance to clarify the regulatory treatment of digital asset trading activities.[42]

39 Swiss Federal Council (2019) *Federal Council wants to further improve framework conditions for DLT/blockchain*. Available at: https://www.admin.ch/gov/en/start/documentation/media-releases.msg-id-77252.html [Last accessed: 06 December 2019].

40 Crypto Valley Association (2019) *Asset Tokenisation under Swiss Law*. Available at: https://cryptovalley.swiss/wp-content/uploads/CVA-Asset-Tokenization-Paper-final-version-FDU.pdf [Last accessed: 12 December 2019].

41 Similar approach taken by other jurisdictions (i.e. Wyoming, Delaware, Liechtenstein, France) are further explored in Section 2.

42 Cambridge Centre for Alternative Finance (2019) *Global Cryptoasset Regulatory Landscape Study*. Available at: https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/cryptoasset-regulation/ [Last accessed: 17 December 2019].

Table 7: Legal and regulatory considerations for trading activities

	Legal considerations	Regulatory considerations
Trading	• Does the legal system allow for a straightforward transfer of digital assets? • Are property rights effectively being transferred when transferring the token? • Does the special legislative regimes created for e.g. scripless shares cover all types of digital assets straightforwardly?	• Does the nature of the supported asset(s) lead to licensing requirements of facilitators? • Is there an objective policy in place to list an asset on the platform? • Do service providers have control over user funds? • What policies are in place to prevent potential exit scams and embezzlement? • Who is responsible for ongoing monitoring of transactions? • How do trading intermediaries perform their reporting duty?

Generally, service providers are required to comply with existing regulations and market conduct rules, but also to meet more specific requirements, in particular when holding investor funds and assets.

Example from abroad: Hong Kong

On 1 November 2018, the Securities and Futures Commission (SFC) in Hong Kong issued a *Conceptual framework for the potential of regulation of virtual asset trading platform operators.*[43] The Framework primarily focuses on trading platforms dealing with digital assets that qualify as securities, pursuant to the Securities and Futures Ordinance. These platform operators have to be licensed, comply with AML/KYC procedures, and meet specific requirements (e.g. disclosure, capital). Platforms trading digital assets that do not constitute securities are encouraged to enter the SFC regulatory sandbox: if the SFC finds that they comply with the regulatory standards for automated trading systems of securities as seen necessary in light of the activity undertaken, the trading platform may be considered for licensing.[44]

Several research papers have discussed how digital assets, DLT, and related concepts may considerably transform modern **clearing** and **settlement** processes.[45] [46] Although it seems improbable that clearing houses and settlement agents will be entirely replaced by automated processes, it is expected that their operations and processes will have to significantly evolve given DLT's native ability to merge both processes into one and execute them in near real-time (**Table 8**).

Table 8: Clearing and settlement activities and actors

Strongly impacted activities

Category	Activity	Description	Actor(s)	Incumbents	New entrants
Clearing & Settlement	Clearing	Ensuring smooth process from trade initiation to final settlement.	Clearing house	ACH	Trades are generally settled on-chain via the underlying value transfer mechanism
	Settlement	Finalising trade between seller and buyer.	Settlement agent	DTCC	

This development raises important legal and regulatory questions that have to be examined by both market participants and relevant authorities (**Table 9**).

43 Securities and Futures Commission (2018) *Conceptual framework for the potential regulation of virtual asset trading platform operators*. Available at: https://www.sfc.hk/web/EN/files/ER/PDF/App%202_%20Conceptual%20framework%20for%20VA%20trading%20platform_eng.pdf [Last accessed: 06 December 2019].

44 Regulatory authorities in other jurisdictions have developed a regulatory response to regulate trading activities. A study published by the CCAF in 2019 found that the vast majority of surveyed jurisdictions regulate exchange services under different regulations depending on the nature of the traded token. Further information can be found in Section 2, CCAF (2019) *Global Cryptoasset Regulatory Landscape Study*. Available at: https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/cryptoasset-regulation/ [Last accessed: 25 February 2020].

45 See for instance Platt, C., Csoka, P., and Morini, M. (2017) *Implementing Derivatives Clearing on Distributed Ledger Technology Platforms*. Available at: https://www.r3.com/wp-content/uploads/2017/11/implementing-derivatives-clearing_R3_.pdf [Last accessed: 04 December 2019].

46 See for instance Euroclear and Oliver Wyman (2016) *Blockchain in Capital Markets. The Prize and the Journey*. Available at: https://www.oliverwyman.com/content/dam/oliver-wyman/global/en/2016/feb/BlockChain-In-Capital-Markets.pdf [Last accessed: 04 December 2019].

Table 9: Legal and regulatory considerations for clearing and settlement

	Legal considerations	Regulatory considerations
Clearing & Settlement	• What underlying platform has been chosen (i.e. permissionless vs. permissioned)? • What is the significance of changes to the state of the relevant blockchain for a jurisdiction's law? Is a change to the state of the blockchain (i) evidential of a changed legal position or (ii) dispositive of a changed legal position? • What about off-chain transactions? When do events in the off-chain world demand alteration of the blockchain? • Should a good faith acquisition regime operate over digital assets? In other words, who should bear the risk when a non-owner transfers a digital asset to an innocent third party?	• In the event of default risk mitigation being handled via smart contracts, how would regulation apply? • Are central security depositories the only type of entity legally authorised to operate a settlement system? • If an instrument/asset exists in other forms outside of the digital asset platform, how is fungibility between the forms ensured? • Are there several systems that have to operate in parallel to track ownership changes? • Does settlement finality on the platform comply with legal finality requirements?

Example from abroad: EU CSD Regulation and Settlement Finality Directive

Article 3(1) and 3(2) of the European Union's Central Securities Depository Regulation (CSDR) requires securities be dematerialised from the moment they are made available for trading on a trading venue. This rule, which also applies to tokenised transferable securities admitted and traded on a European trading venue, will require CSD to perform depositary services for tokenised assets to serve the tokenised security market.

Similarly, regulators in the EU are still exploring how the Settlement Finality Directive (SFD) would apply to a security settlement system using DLT. While permissioned DLT system should be able to comply with relative ease with SFD, the requirement of the existence of a "system operator" would prevent the use of permissionless DLT systems. A recent report by a group of experts set up by the EU Commission recommended to revise the SFD to "allow for the participation in clearing and settlement and payment systems of any type of regulation financial institution, on the basis of appropriate risk-based criteria."[47]

The promise of digital assets to significantly improve the efficiency of post-trade processes brings its share of challenges and complexities. Digital asset **custody** implies that assets are controlled by cryptographic keys, which require new technical infrastructure and expertise, mandating a strong focus on cybersecurity and key management. Effective key management will require the development of new safekeeping models, recovery processes, and operational procedures. This technical emphasis may also have implications for insurance markets and providers.

Custodians are traditionally also responsible for **asset servicing**. In a DLT-based environment, smart contracts can enable the automation of tasks related to asset servicing by encoding rights and obligations directly into the assets, further reinforcing the technical skill set and expertise that will be expected from custodian.

Table 10: Servicing activities and actors

Strongly impacted activities

Category	Activity	Description	Actor(s)	Incumbents	New entrants
Servicing	Asset management	Managing asset portfolios on behalf of clients on a commission basis.	Asset manager, Fund manager	Blackrock, The Vanguard Group	Bitwise, Coinshares
	Custody	Safekeeping of assets.	Custodian	BNY Mellon, Kasikornbank	Fidelity Digital Assets
	Asset servicing	Providing operational and administrative services (e.g. interest and dividend payment, corporate actions).	Custodian		

47 European Commission (2019) *Final report of the Expert Group on Regulatory Obstacles to Financial Innovation: 30 recommendations on regulation, innovation and finance*. Available at: **https://ec.europa.eu/info/publications/191113-report-expert-group-regulatory-obstacles-financial-innovation_en** [Last accessed: 17 December 2019].

Table 11: Legal and regulatory considerations for servicing activities

	Legal considerations	Regulatory considerations
Servicing	• Could one be said to "possess" a digital asset in virtue of knowing or storing a private key? • What other concepts could provide an alternative to possession (e.g. "control")? • Who will be held liable if anything goes wrong during the transfer of title or dividends payment while using smart contracts?	• Is there a back-up key in case of an operational failure? • How is that process being handled and what entities are taking part in it? • In the event of potential forks and airdrops, do custodians have a legal obligation to provide these new assets to their customers? • How will new forms of custody comply with existing regulations (e.g. multi-signature addresses)? • What additional requirements, in particularly related to technical infrastructure and cybersecurity, have to be met by digital asset custodians to account for the new forms of custody introduced by digital assets? • How would external reconciliation of asset ownership be performed in the context of digital assets representing assets existing outside the platform?

Example from abroad: Germany

On 29 November 2019, the German Federal Council approved a new legislative framework for digital asset custody,[48] which provides licensing requirements for the safekeeping of digital assets, administration of digital assets, and safeguarding of digital assets/key management services. These requirements are predominantly derived from the general provisions of the German Banking Act, and relate to, among other things, minimum capitalisation and personnel. Surprisingly however, the IT security requirements for digital asset custody reflect those imposed on banks and other investment firms, but do not account for the technical specificities of digital assets. These new rules apply to any custody service providers operating in Germany, regardless of whether they are physically established in the country.[49]

3.4 Tangential Services

Tangential activities exist to support and ensure an effective conduct of primary and secondary market activities, such as infrastructure services (e.g. the development, maintenance, and operation of the core digital asset platform) and ancillary services to assist with the lifecycle management of digital assets.

Infrastructure

The fundamental nature of most infrastructure-related activities remains unchanged, i.e. the development and maintenance of software, systems, and networks. However, acquiring a new set of skills and expertise to handle the underlying technology, associated protocol frameworks, and alternative software development kits will be paramount for incumbents to protect their market share and position. New entrants may have a technical competitive advantage over slowly-moving incumbents, and partnerships between incumbents and new technology providers have already been formed as a result of this evolving landscape.

In particular, platform governance, permission management, and other operational processes (i.e. **network operation**) will require additional technical know-how and new business processes (**Table 12**).

48 AMB Crypto *Germany's crypto-custody law remains an optimistic* mystery. Available at : **https://eng.ambcrypto.com/germany-crypto-custody-law-remains-an-optimistic-mystery/** [Last accessed: 30 January 2020].

49 Regulatory authorities in other jurisdictions have developed a regulatory response to regulate custody services for digital assets. A study published by the CCAF in 2019 found that the vast majority of surveyed jurisdictions regulate custody services under AML law or a bespoke regulatory regime. Further information can be found in Section 2, CCAF (2019) *Global Cryptoasset Regulatory Landscape Study*. Available at: **https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/cryptoasset-regulation/** [Last accessed: 25 February 2020].

Table 12: Infrastructure activities and actors

Strongly impacted activities

Activity	Description	Actor(s)	Incumbents	New entrants
Network operation	Platform governance and operation (generally includes permissions management).	Network operator	New-York Stock Exchange (NYSE)	Swiss Digital Exchange
Gatekeeping	Platform access management.	Gatekeeper	New-York Stock Exchange (NYSE)	Swiss Digital Exchange
Platform development	Technical development of platform.	Technology provider	IBM, Oracle	R3, Consensys
Technical support & maintenance	Technical support services to ensure operations run smoothly.	Technology provider, Network operator		
Oracle services	Providing exogenous information and data to the platform.	Oracle service provider	Refinitv	Oraclize
Application development	Building applications on top of the platform.	Application developer	Accenture, IBM	
Integration	Integration of platform with existing systems.	Gateway, Technology provider		

Beyond traditional infrastructure services, the properties of digital assets and the underlying infrastructure have enabled new types of activities (**Table 13**). **Transaction validation** and **processing** are examples of such processes native to DLT networks that operate in a distributed manner involving multiple participants. Depending on the final design and implementation, these activities may be subject to licensing and registration requirements or other regulations.

Asset tokenisation involves the encoding of a set of pre-determined conditions and rights in smart contracts. Given the technical skillset necessary for the development of these pieces of code, it is expected that such tasks would be performed by new types of technology actors, i.e. **smart contract developers**, on behalf of the issuer. They may as well fall under the perimeter of an **asset tokeniser** who will be responsible for initialising and executing the smart contract.

Table 13: Novel infrastructure activities and actors

New activity

Activity	Description	Actor(s)	New entrants
Transaction validation	Validating and broadcasting transactions ("full nodes").	Full node operator, Validator	Infrachain, Bitmain, Slushpool, F2Pool, Chorus One
Transaction processing	Confirming and ordering transactions ("consensus nodes").	Mining pool operator, Hasher, Staker, Validator, Record producer	
Smart contract development	Developing of smart contract templates and custom programmes.	Smart contract developer	Contract Vault, Validity Labs
Asset tokenisation	Tokenising assets through smart contracts on behalf of the issuer.	Asset tokeniser	SE Digital
Key management services	Secure platform for issuing, storing, transferring, and revoking cryptographic keys.	Key management service provider	Casa, BitGo, OnChain

Since technology providers will undertake these tasks on behalf of the issuer, regulatory authorities would have to clarify whether liability rests with the issuer, the smart contract developer, or the asset tokeniser (**Table 14**). Regardless of the underlying actors, such technical functions also call for the development of high security standards.

Similar to existing financial market infrastructure, technology development, support, and maintenance agreements will have to be established to determine the scope of work, liability in the event of a technical failure, and operational processes required in case specific transactions would need to be unwound (i.e. translation of governance framework to technical system). Additionally, it remains to be seen — at least in certain jurisdictions — whether developers and infrastructure providers will be subject to licensing and/or registration requirements.

Table 14: Legal and regulatory considerations for infrastructure activities

	Legal considerations	Regulatory considerations
Infrastructure	• What technical operations on the digital asset platform might constitute legal dealings? • Who will be held liable if anything goes wrong during the initialisation and execution of smart contracts? • Who will be coding these scripts and supervising their operation? • Who decides to change the ledger in response to an external event or action, and how do they effect that change? • Should the technical system allow for a judge to direct the entity controlling the ledger to adjust it? • What kinds of action are proposed to be automated, and in what manner? • Does the proposed operation of transactional scripts satisfy normal requirements of contract formation (e.g. consensus ad idem, signature, writing)?	• Are infrastructure service providers, such as developers, asset tokenisers, subject to a licensing regime? • Should the digital asset platform provide a "trading halt functionality"? • Does network operator/platform manager have to meet specific requirements?

Example from abroad: FinCen and the regulation of money services businesses (MSBs) in the US

On 9 May 2019, the Financial Crimes Enforcement Network (FinCEN) in the United States released further guidance on the application of the Bank Secrecy Act (BSA) to businesses dealing with digital assets.[50] While its main focus lies on primary and secondary market actors, the guidance also explicitly indicates that most infrastructure services providers, such as software developers, mining pool operators, miners, do not qualify as money transmitters under the BSA and hence do not have to comply with BSA obligations.[51]

Ancillary services

With regard to ancillary services, unseen functions have primarily emerged in relation to the provision of **data and analytics**, as well as **AML/KYC services**: for instance, the public nature of blockchain transactions enables real-time transaction monitoring and investigation via blockchain screening and analysis. While these tools can lead to new forms of market surveillance, they do have a steep learning curve and require additional technical infrastructure (**Table 15**).

Table 15: Ancillary services and related actors

Strongly impacted activities

Activity	Description	Actor(s)	Incumbents	New entrants
Banking services	Accepting customer deposits and issuing loans to customers.	Commercial bank, Saving institution	Wells Fargo, BNP Paribas	Seba, Sygnum
Data & analytics	Providing market data and analytics.	Data aggregator, Network data provider	Bloomberg	Brave New Coins, Coinmetrics
AML/KYC services	Verification of user/holder identity, source of funds, transaction sizes, politically exposed persons, and sanctions testing.	AML/KYC service provider	Jumio	Scorechain, Elliptic
Market surveillance	Preventing, detecting, and investigating abusive practices in markets.	Market surveillance system provider	Nasdaq Smarts	Solidus Labs
Legal services	Deal structuring, regulatory analysis, documentation, compliance, etc.	Law firm	Kirkland & Ellis, Clifford Chance	Diacle, MME
Cybersecurity	Developing, testing, and managing system security capabilities and assessing cybersecurity risks.	Cybersecurity service provider	Symantec	Beosin, OpenZeppelin
Advisory	Providing customised advice to clients on a commission basis.	Investment advisor	PIMCO, Capital Group Co.	Galaxy Digital, CoinFund
Investment promotion	Actively promoting specific investments.	Investment promoter	Hargreaves Lansdowne	ICO advisors and "influencers"
Rating services	Assigning ratings based on a standardised methodology.	Rating agency	Moody's, S&P, Fitch	CryptoCompare, ICORatings
Accounting services	Bookkeeping, taxation, and annual report preparation.	Accounting firm	KPMG, EY	Harvex, CryptoAPAs

50 FinCEN (2019). *FinCEN Guidance - Application of FinCEN's Regulations to Certain Business Models Involving Convertible Virtual Currencies*. Available at: https://www.fincen.gov/sites/default/files/2019-05/FinCEN%20CVC%20Guidance%20FINAL.pdf [Last accessed: 06 December 2019].

51 A study published by the CCAF in 2019 found that 45% of analysed jurisdictions have explicitly indicated that infrastructure activities (in particular mining) fall outside the scope of their regulatory perimeter, whereas 36% do not mention infrastructure activities at all in their guidance/regulations. Only 5% of jurisdictions have indicated that mining activities could potentially be subject to a licensing regime. Further information can be found in Section 2, CCAF (2019) *Global Cryptoasset Regulatory Landscape Study*. Available at: https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/cryptoasset-regulation/ [Last accessed: 25 February 2020].

Activity	Description	Actor(s)	Incumbents	New entrants
Professional services	Consulting, training, and education.	Professional service firm	Capgemini, Accenture	11:FS
Audit	Conducting audits of financial statements, custody arrangements, and similar activities.	Audit firm	PwC, Deloitte	
Insurance	Providing compensation and insurance policies.	Insurance company	AXA, Allianz	AON

A specific set of firms have emerged to provide macro-level data and analytics about DLT-based networks, also called "on-chain data". On-chain data consists of information about the operational and economic activity occurring on the network that can be observed by running a full node. Beyond the necessary technical skills to process the data received from the network, these actors also have a strong understanding of the economics of the networks to remove noise from the data and capture real economic activity.

In addition to traditional AML/KYC checks at the investor onboarding stage, new forms of monitoring have to be performed, often referred to as Know-Your-Transaction (KYT) to support service providers' duty to report fraudulent transactions. To be fully compliant with AML regulations, financial institutions rely on automated transaction monitoring solutions developed by companies that transcribe blockchain transaction data into "readable data".

There are no specific legal and regulatory considerations associated with ancillary services in the context of digital assets, other than complying with existing laws and regulations, adjusting the AML/KYC requirements to investors' risk profile, and adapting processes to allow actors to benefit from improved transaction monitoring and reporting.

4

A Conceptual Framework

Section 4: A Conceptual Framework

Purpose

Use cases can be implemented in a variety of ways and may involve multiple asset and token types that might be structured differently. Each design decision will entail specific legal and regulatory questions that need to be carefully assessed. As each use case implementation is unique, there is no single "golden" rule that adequately captures the associated complexities across a broad set of applications. Instead, each implementation needs to be individually evaluated on a case-by-case basis according to a clear set of guidelines and criteria.

This section introduces a conceptual framework that acts as a tool to identify potential legal and regulatory considerations that arise from the deployment of a digital asset within the implementation of a specific use case. The framework provides a standardised way for assessing various implementation and design options that lead to reproducible comparisons, thereby facilitating the identification of potential legal and regulatory considerations that need to be taken into account.[52]

Characteristics

The framework has been designed to ensure the following characteristics:

- **Generic:** can be applied to any asset type and implementation across all industries.
- **Flexible:** not set in stone; instead, it can be horizontally and vertically expanded by adding new components, categories, options, and examples.
- **Technology-agnostic:** not specific to a particular technology, but broadly applicable to any technology (thereby showing how the choice of a given infrastructure may impact the legal and regulatory assessment).
- **Comparative:** different implementations of the same asset type (e.g. shares of a company existing in the form of (i) CSD ledger entries, (ii) paper certificates, and (iii) DLT tokens) can be directly compared in a visual manner so that potential legal and regulatory differences related to the form of the asset are immediately visible.

Components

The framework is based on four main dimensions (*rights*, *representation*, *issuance*, and *transferability*), which are further subdivided into categories and sub-categories. Each option is illustrated by one or several examples to facilitate understanding.

The first dimension covers the **rights** associated with an asset by analysing a set of related elements that involve looking at a potential underlying, the type of rights conferred to the holder, the potential presence of counterparties against which holders may have a contractual claim, dispute resolution and enforcement, as well as the potential amendment of rights ex post (**Table 16**).

52 While this report presents the framework in table format it can also be represented in other formats (e.g. mind map, decision tree) to better visualise potential differences between multiple token types and implementation options. A slide deck provided to SET as part of an earlier deliverable illustrates the framework's versatility via a coloured mind map representation.

Table 16: What rights are associated with the asset?

Dimension	Category	Sub-category	Options	Examples
Rights What rights are associated with the asset?	**Underlying** Is the asset based on some underlying?		**No:** not based on some underlying.	
			Other asset: based on some other, already existing asset.	Financial asset; Non-financial asset; Other asset (e.g. cryptoasset)
			Occurrence: based on some exogenous occurrence.	Event (e.g. weather, outcome of a game/bet); Rate (e.g. interest rates, exchange rates); Index
	Types What type of rights does the asset confer to its holder?		**Delivery:** right to claim the delivery of some object.	Underlying asset; Other (e.g. voucher)
			Interests: granted interest rights.	Voting; Board representation; Dividends; Interest rate payments; Information; Other
			Access/usage: right to use a platform or service.	Platform (e.g. gaming, social network, streaming); Service (e.g. Wifi, transportation); Other
			Other: additional rights not covered by the categories above.	
	Counterparty Is there a counterparty against which the asset holder may have a contractual claim?	**Issuer:** entity that creates the asset.	**Formal issuer:** identifiable entity (generally a legal person).	Financial institution; Public Institution; Service/Platform provider; Other
			No formal issuer: non-identifiable entity.	Decentralised public network based on automatically-enforced protocol rules (e.g. Bitcoin network)
		Facilitator: entity that facilitates access to, or transfer of, the asset.	Custodian; Broker; Exchange; Asset issuer; Other	
	Enforcement How are disputes resolved in case of disagreements?	**Legal:** rights are enforced via the legal system.	**Governing law:** which law governs potential disputes involving the asset?	Domicile of Issuer, Facilitator, Asset holder, Platform operator, or Other
			Jurisdiction: which territory has jurisdiction?	Domicile of Issuer, Facilitator, Asset holder, Platform operator, or Other
		Extralegal: rights are enforced via extralegal means that do not (at least directly) involve the legal system.	**Mediation:** assistance of neutral third party.	
			Arbitration: alternative dispute resolution via arbitrator.	
			Technical: automated enforcement based on pre-established rules.	Smart contracts
			Social/community: generally informal process involving community members.	Governance in open, permissionless blockchains (e.g. Bitcoin, Ethereum)
	Amendment Can rights be amended after the asset has been issued?	**Process:** what is the process in place for amending rights associated with the asset?	**Formal:** full specification in written, generally agreed upon by the parties before entering the agreement.	Clauses in contractual agreement
			Informal: no formal specification in written, but rather emerging process through social interactions.	Social community governance in open and permissionless blockchains
		Authority: which entity has the authority to amend rights associated with the asset?	**Unilateral:** a single entity has the authority to unilaterally amend rights.	Issuer; Facilitator; Regulator; Court; Other
			Multilateral: multiple entities are required to coordinate in order to amend the rights associated with the asset.	(Qualified) Majority; Federation; Contract parties; Other

The second dimension examines the **representation** of the asset, i.e. the specific form that it will take (**Table 17**). An asset can be either tangible (physical) or intangible (immaterial/virtual), with the latter raising an important question about control over the registry in which the asset exists in the form of a ledger entry.

Table 17: What form does the asset take?

<table>
<tr><th>Dimension</th><th colspan="2">Category</th><th colspan="2">Options</th><th>Examples</th></tr>
<tr><td rowspan="5">Representation
What form does the asset take?</td><td colspan="2" rowspan="3">Tangible
Asset is material (i.e. of physical nature).</td><td colspan="2">Natural form: original form of physical object.</td><td>Commodities (e.g. gold, silver); Real estate; Collectibles (e.g. fine art); Consumables (e.g. wine)</td></tr>
<tr><td colspan="2">Full-bodied token: asset is represented via a physical token whose medium has intrinsic value.</td><td>Gold-based coins</td></tr>
<tr><td colspan="2">Paper-based: asset is represented in paper form whereby the medium has no intrinsic value.</td><td>Bank notes; Share certificates; Funfair tokens</td></tr>
<tr><td rowspan="2">Intangible
Asset is immaterial (i.e. of non-physical, virtual nature).</td><td rowspan="2">Registry-based: asset exists in the form of a ledger entry in a database.</td><td>Entity-controlled: ledger is controlled and operated by a single entity who maintains full authority.</td><td>Bank ledgers; Internal company accounts; Public sector registers</td></tr>
<tr><td>Shared registry: ledger is jointly controlled, and operated by separate parties.</td><td>Open: anyone can join the shared registry and contribute to ledger maintenance (e.g. Bitcoin, Ethereum)
Semi-open: system is open to third parties under specific conditions (e.g. Ripple, Wikipedia)
Closed: system is closed by default and only accessible to a limited number of pre-vetted and authorised parties (e.g. private permissioned blockchain)</td></tr>
<tr><td colspan="2">Digital file: asset whose "natural" form is digital but does not directly depend on being recorded in a registry.</td><td>Music files; Digital documents; Software packages</td></tr>
</table>

The third dimension analyses the **issuance** process of an asset which is divided into two parts (**Table 18**): the creation (i.e. how new units are created) and the distribution (i.e. how newly-created units are distributed to market participants). This includes issuance and distribution mechanisms as well as questions related to the issuer(s) and the type of entities that are allowed to participate in the initial distribution of the asset.

Table 18: How are new asset units created and distributed?

Dimension	Category	Sub-category	Options		Examples
Issuance How are new asset units created and distributed?	**Creation** How are new asset units created?	**Issuer:** Which entity has the authority to create new asset units?	**Single entity:** one party has exclusive rights to create new asset units.		Corporation; Public institution; Other
			Multiple entities: multiple parties have the right to create new asset units.		Consortium; Cooperative; Association; Federation; Other
			Other: involves more complex hybrid arrangements.		
		Frequency: According to what schedule are new asset units created?	**One-time event:** asset units are only created once in one batch.		Company shares (excl. capital increases); Ripple's XRP
			Continuous: asset units are created on a continuous/ recurring basis.	**Pre-determined schedule:** transparent issuance schedule	Bitcoin (BTC); Ether (ETH)
				Discretionary: at sole discretion of the issuer	Central bank reserves; Cash; Vouchers
				On demand: in response to demand events	Commercial bank money (based on loans and deposits); gold certificates (after physical gold has been deposited in custody)
		Mechanism: What is the mechanism through which new asset units are created?	**Ad hoc:** new asset units are created "ex nihilo" on an ad hoc basis.		
			Mining: new asset units are via the underlying system's network consensus process.		Cryptocurrency mining and staking
	Distribution How are newly-created asset units distributed to third parties?	**Access:** What entities are allowed to participate in the initial distribution of newly-created asset units?	**Unrestricted:** anyone can participate in the initial distribution without restrictions.		Cryptocurrency mining and staking
			Restricted: specific restrictions are in place to limit access to privileged parties.		Investor requirements (e.g. securities offerings)
		Mechanism: Through what mechanism are newly-created asset units distributed?	**Sale:** newly-created asset units are sold to interested parties.		Securities offering (e.g. IPO)
			Reward: newly-created asset units are distributed to participants as a reward, generally in exchange for contributing resources.		Airline miles; cryptocurrency mining
			Depository receipt: a depository receipt is issued to a third party in exchange for depositing exogenous objects into custody.		Gold bars deposited in vault; Cash deposited at bank

The fourth and final dimension looks at **transferability**, i.e. how asset units can "change hands" (**Table 19**). Registry-based assets are only transferable via updating the relevant ledger entry, which raises questions regarding the initiation of transfer requests by asset holders and the control over the ledger update process (i.e. what entity is authorised to update the ledger).

Table 19: Through what means can asset units be transferred?

<table>
<tr><th>Dimension</th><th>Category</th><th>Sub-category</th><th colspan="2">Options</th><th>Examples</th></tr>
<tr><td rowspan="5">Transferability
Through what means can asset units be transferred?</td><td rowspan="4">Ledger update
Changes in ownership are executed by updating a ledger entry.</td><td>Initiation: how can an ownership transfer be initiated (i.e. proposed)?</td><td colspan="2">Unrestricted: asset holder can initiate a transfer without restrictions.</td><td>Cash transfers; On-chain cryptocurrency transactions</td></tr>
<tr><td rowspan="3">Control: which entity has the authority to execute a ledger update?</td><td colspan="2">Restricted: proposed transfer is subject to restrictions.</td><td>Whitelisted participants (e.g. accredited investors); Need to go through an intermediary (e.g. Digital Asset Custodian. Bank)</td></tr>
<tr><td colspan="2">Unilateral: a single entity has the authority to unilaterally update ledger entries.</td><td>Bank accounts; Company platforms</td></tr>
<tr><td rowspan="2">Multilateral: multiple entities are involved in the process of updating ledger entries.</td><td>Permissionless: anyone can participat in the ledger update process.</td><td>Mining or staking in cryptocurrency networks</td></tr>
<tr><td>Permissioned: only a set of pre-determined and authorised participants are allowed to participate in the ledger update process</td><td>Consensus nodes in permissioned blockchains; Federation members; Other</td></tr>
<tr><td colspan="2">Physical delivery
Changes in ownership are executed by the asset physically changing hands.</td><td colspan="2"></td><td>Cash; Gold; Certificates; Other physical objects</td></tr>
<tr><td colspan="2">Replication
Asset is transferred via replication</td><td colspan="2"></td><td>Digital files; Software packages; Other</td></tr>
</table>

This framework is intended to serve as a useful tool for helping companies, institutions, and regulators reason about different asset types and identify potential legal and regulatory considerations that may arise from a particular implementation. The generic nature of the framework ensures that it can be applied broadly to both tangible and intangible assets (including digital assets) irrespective of the underlying technology. It is worth recalling that the framework is extendable and can be tailored to the needs and requirements of the assessor, which may evolve over time as new information and practices become available.

Key Recommendations

Based on the above analysis, the following recommendations are provided to serve as a basis for discussion for the legislature, regulatory authorities and other actors engaging with digital assets.

Terminology and definitions

1. Regulatory authorities should focus on the substance of the asset and the rights associated with it, rather than its form, unless the form changes the substantive nature of the asset.

2. Definitions should be clear and unambiguous to avoid potential overlap with existing asset types and provisions.

3. Cryptoassets — digital tokens issued by and transferred over open and permissionless networks with no formal operator that play an indispensable role in the economic incentive design of the underlying shared ledger or application — should be explicitly distinguished from other types of digital assets.

4. From a legal perspective, digital assets should be considered as analogous to book-entry or registered assets (i.e. account-based), rather than certificates or cash (i.e. token-based). This departs from many popular accounts and even some technical legal accounts of digital assets.

Property rights

5. A jurisdiction's authorities should choose proper analogies to explain and clarify how private law, and in particular property law, apply to digital assets.

6. In most jurisdiction, further clarification is needed from the legislature on the legal recognition of purely digital objects to understand whether (and how) dealing with a digital token has legal consequences for real world rights. In particular whether intangible, digital representation can be recognised as an object of property rights.

7. It is highly desirable to establish how digital assets and cryptoassets can be objects of the right of ownership under existing law, whether through amendment to general provisions or the creation of an insulated special regime. While the "up-front" costs of the former are higher, it would provide a solid basis on which to build an information-based financial economy for the 21st century. On the other hand, provided conflicts and inconsistencies between the special regime and the general code are avoided, there may be advantages to going with the latter approach in the first instance.

8. The conventional concept of possession cannot apply to digital assets. While possible, there are good reasons to avoid "stretching" the concept. It would be better to start from the premise of exclusive control over information in a digital ledger, and to develop appropriate actions and remedies rather than working by analogy with physical possession. The details will vary depending on the details of the cryptographic or other security system utilised in a given case (e.g. knowledge of private keys controlling unspent transaction output on the Bitcoin protocol might be said to give a person "control"). This will remain an area of contention and solutions will be highly jurisdiction-specific, particularly the extent to which "control" can play the same role as possession in the mechanics of the relevant property law system.

Transfer of title

9. If a digital token were issued to represent assets subject to requirements of form, the asset ledger would have to inter-operate with the relevant official register in order to ensure that rights could be transferred effectively by transferring tokens on the asset ledger. This might be achieved by means of a special provision. Generally, it would be necessary to ensure that the ledger satisfied all of the formal requirements (e.g. for writing, signature, etc.) for the transfer of property rights in the underlying asset, and it would probably be necessary to ensure that the competent official had some privileged access to the digital asset ledger.

Good faith acquisition

10. A good faith acquisition regime should be developed and tailored to digital assets where it is desirable that the transferee of a digital token should get clear title even when there are defects in the title of the transferor. In our view, it is important to accurately describe what actually occurs: a ledger is being changed, and the changes are taken to transfer legal title as between the users of the system. While this can be treated as analogous to a change of possession, in reality there is the destruction of one ledger entry and the creation of a new one, and indefeasible legal consequences are being attributed to this change of the ledger.

Remedies

11. If digital assets are recognised as fitting objects of the right of ownership, petitory remedies (i.e. protection to the owner's title) should be available to restore control over the asset to its rightful owner, rather than possessory remedies (i.e. protect the rights of one in possession).

Intermediaries

12. It is recommended that regulatory authorities should avoid, to the extent possible, parallel regimes for "conventional" and digital assets when the objects and associated activities are similar or identical: instead, the use of existing licensing regimes and applicable regulations for digital asset activities that exhibit no material differences to similar activities found in traditional capital markets (e.g. investment advisory and promotion) should be encouraged.

13. Regulatory authorities should explicitly distinguish between custodial and non-custodial service providers: the former should be subject to stringent cybersecurity and governance requirements, have strict refund policies in place, and be subject to regular security and proof-of-funds audits. A potential licensing or registration regime may mandate the use of state-of-the-art technical standards.

14. The dominant technical component and potential shared responsibility arising from the platform design may call for the establishment of rigorous and clear standards in terms of infrastructure requirements, security, and governance.

15. Where a bespoke regulatory framework exists for actors dealing with digital assets, regulatory should avoid redundancy in the context of traditional instruments in digital form and put a duplicative burden on existing actors. This may lead to rising compliance costs for already-regulated industry actors and require a considerable increase of regulatory resources for supervision and monitoring.

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