Law Commission

Reforming the law

Digital Assets: Consultation paper

Consultation Paper 256

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Reforming the law

Law Com No 256

Digital assets

Consultation paper

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THE LAW COMMISSION – HOW WE CONSULT

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Topic of this consultation: Proposals for law reform in respect of certain digital assets as objects of property rights.

Geographical Scope: This consultation applies to the law of England and Wales.

Duration of the consultation: We invite responses from 28 July to 4 November 2022.

Responses to the consultation may be submitted using an online form at: https://consult.justice.gov.uk/law-commission/digital-assets-consultation. Where possible, it would be helpful if this form was used.

Alternatively, comments may be sent:

By email to digitalassets@lawcommission.gov.uk

OR

By post to Commercial and Common Law Team, Law Commission, 1st Floor, Tower, 52 Queen Anne's Gate, London, SW1H 9AG.

If you send your comments by post, it would be helpful if, whenever possible, you could also send them by email.

Availability of materials: The call for evidence and interim update paper which preceded this consultation paper, and this consultation paper, are available on our website at https://www.lawcom.gov.uk/project/digital-assets/. We are committed to providing accessible publications. If you require this consultation paper to be made available in a different format please email digitalassets@lawcommission.gov.uk or call 020 3334 0200.

After the consultation: We will analyse the responses received and undertake further stakeholder engagement as appropriate. This will inform our final recommendations for reform to Government, which we will publish in a report.

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Contents

Glossary

Term	Definition
Airdrop	A distribution of an allocation of crypto-tokens, often unsolicited and normally for free.
Algorithm	A finite sequence of instructions, typically used to solve a class of specific problems or to perform a computation.
Assignment	The transfer of a right from one person to another.
Bailment	A bailment occurs when one person is voluntarily in possession of a tangible thing that belongs to (is owned by) another, usually for a specific purpose.
Bitcoin	See paragraph 10.16.
bitcoin	The native notional quantity unit which exists within, and as a result of, the Bitcoin system.
Blockchain	A method of recording data in a structured way. Data (which may be recorded on a distributed ledger or structured record) is usually grouped into timestamped "blocks" which are mathematically linked or "chained" to the preceding block, back to the original or "genesis" block.
Burn address	A crypto-token public address the private key to which is unknown. This type of address is normally used to remove tokens from circulation, thus reducing the total number and so "burning" or "destroying" them.
Charge	A type of non-possessory security interest that can be taken over an asset. The owner of the asset creates a property right in relation to that asset in favour of the person who takes the benefit of the charge.

Code	A language used to give instructions to computers.
Computer program	A collection of instructions written in code that are executed by a computer.
Conversion	An action in tort for wrongful interference with possession.
CREST	A central securities depository in the United Kingdom.
Cryptoasset	See paragraph 10.4.
Crypto-token	See paragraph 10.3, Chapter 10 and Appendix 4.
Custody	An arrangement under which a person holds objects of property rights for or on behalf of another person(s) and has the capacity to exercise or to coordinate or direct the exercise of factual control (both positive and negative) over such objects. The legal consequences of a custody arrangement will differ depending on the structure and terms of the arrangement.
Data structure	A data structure is a specialised format for organising, processing, retrieving and storing data.
Decentralised finance / DeFi	A general term for automated and purportedly decentralised and/or disintermediated applications (Dapps) providing financial services on a (generally decentralised and often blockchain-based) settlement layer, including payments, lending, trading, investments, insurance, and asset management.
Digital asset	Any asset that is represented digitally or electronically. There are many different types of digital assets, not all of which will be capable of attracting personal property rights. In the consultation paper, we use the term in a broad sense.

Distributed ledger	A digital store of information or data. A distributed ledger is shared (that is, distributed) among a network of computers (known as nodes) and may be available to other participants. Participants approve and eventually synchronise additions to the ledger through an agreed consensus mechanism.
Distributed ledger technology ("DLT")	Technology that enables the operation and use of a distributed ledger.
Domain Name System	A database of the associations between domain names and the Internet Protocol addresses to which they resolve (translate).
ether	The native notional quantity unit which exists within, and as a result of, the Ethereum system.
Fiat currency	Currency that is accepted to have a certain value in terms of its purchasing power which is unrelated to the value of the material from which the physical money is made or the value of any cover which the bank (often a central government bank) is required to hold.
Fungible	A subjective quality of things that parties are willing to accept as mutually interchangeable with other things of a similar kind, quality and grade. For example, pound coins are generally treated as a class of fungible things because one pound coin is generally accepted by counterparties as equivalent to and interchangeable with another pound coin. Other classes of things that are generally treated as fungible include gold, crude oil and shares in a company.
Graphical user interface	An interface through which a user may interact with electronic devices. The user is able to interact with visual representations of information rather than inputting code.
Immediate intermediary	The intermediary with whom the ultimate investor has a contractual and/or trust-based relationship.

Instantiated / Instantiation	See paragraph 10.26 for our description of how we use this term in this consultation paper.
Intermediary	An individual or, more commonly, an organisation which holds an interest in securities or other objects of property rights on trust for another, who may be another intermediary or the ultimate investor.
Intermediated securities	Interests in investment securities which are held by participants through an intermediary or a chain of intermediaries.
Internet Protocol	The protocol, consisting of a set of rules, by which information (in the form of data packets) is routed, addressed and transmitted across the networks that constitute the internet.
Layer 1	A general term used to describe base-level blockchain or crypto-token architecture, systems, networks or protocols.
Layer 2	A general term used to describe a secondary protocol built on top of an underlying ("Layer 1") blockchain or crypto-token architecture, system, network or protocol. Layer 2 protocols generally use the underlying Layer 1 protocol for certain functions, including settlement of transactions and transaction security. We discuss Layer 2 solutions in more detail in Appendix 5.
Lien	A right to retain possession of a thing until a claim or debt has been satisfied.
Multi-signature arrangement	Multi-signature arrangements are also referred to as M-of-N arrangements, with M being the required number of signatures or keys to authenticate an operation and N being the total number of signatures or keys involved in the arrangement.

Negotiable/Negotiability	Negotiability means not only that an instrument is transferable but also that in the hands of a holder in due course (broadly a good faith purchaser for value without notice that has satisfied all relevant formalities), it is enforceable despite a defect in the title of any prior holder. In other words, the transferor who negotiates a bill to a holder in due course can pass a better title than they themselves possess.
Novation	A process by which the rights and obligations under a contract are taken up by a third party through the extinction and replacement of the original contract.
Off-chain / on-chain	"Off-chain" refers to actions or transactions that are external to the distributed ledger, structured record, blockchain or crypto-token system. "On-chain" refers to actions or transactions that are recorded on the distributed ledger or blockchain.
Omnibus account	An account which is used to hold the securities of more than one investor on a pooled unallocated basis (in contrast to a "individually segregated account").
Permissioned	Requiring authorisation to perform a particular activity.
Permissionless	Not requiring authorisation to perform a particular activity.
Pledge	A type of security interest involving a debtor transferring possession of the object of property rights serving as security to a creditor. It is therefore a type of bailment.
Private key	See "Public key cryptography".
Public key	See "Public key cryptography".

Public key cryptography	Public key cryptography, or asymmetric cryptography, is an encryption scheme that uses two mathematically related, but not identical, keys (normally structured as long strings of data) — a public key and a private key. The generation of such key pairs depends on cryptographic algorithms which are based on mathematical problems. Each key performs a unique function. The public key is used to encrypt and the private key is used to decrypt. So in a public key cryptography system, any person can encrypt a message using the intended receiver's public key, but that encrypted message can only be decrypted with the receiver's private key.
Smart contract	Computer code that, upon the occurrence of a specified condition or conditions, is capable of running automatically according to pre-specified functions.
Smart legal contract	A legally binding contract in which some or all of the contractual terms are defined in and/or performed automatically by a computer program.
Stablecoin	Crypto-tokens with a value that is intended to be pegged, or tied, to that of another currency, commodity or financial instrument. The peg might be based on assets held by the issuer, or on a mathematical algorithm and is generally intended to remain on a stable (often 1:1) basis over time.
Staking	The term staking derives from its use within the “proof-of-stake” type of consensus mechanism used by certain blockchains or crypto-token systems to achieve distributed consensus. Under proof-of-stake consensus mechanisms, validators transfer or “stake” capital or value into a smart contract within the system. This staked value then acts as collateral that can be destroyed if the validator behaves in certain, pre-agreed ways which are considered to be negative for the overall consensus mechanism or system security (such as acting dishonestly or lazily). The validator is then responsible for checking that new blocks propagated over the network are valid and occasionally creating and propagating new blocks themselves. The validator is rewarded (often with new crypto-tokens) for undertaking this process (and contributing to the overall security of the consensus model) and penalised by the destruction of some

	or all of its staked collateral if it behaves in certain negative ways. The term staking has recently been used by market participants in a broader, less specific way, simply to refer to transferring or locking certain capital or value to smart contracts in return for a reward, even where no positive contribution is made by the staker and/or where the staked capital or value is not at risk.
State change / transfer operation that effects a state change	See paragraph 12.63
Unspent transaction output (UTXO)	The output of a valid transaction on certain crypto-token systems, which is available to be used by the transferee as the input for a new transaction. The distributed ledger or structured record of the crypto-token system records (in the form of data) these available and spendable transaction outputs.
Uniform Resource Identifier (URI)	A string of characters that uniquely identifies a name or a resource. A URI identifies a resource by name, location or both.
Wrench attack	A wrench attack is where an attacker physically coerces a holder of crypto-tokens either to transfer those crypto-tokens or give up control of those crypto-tokens (for example by giving over their private key). It is called a wrench attack because a wrench might be a suitable object with which to physically coerce someone.
Zero-Knowledge Succinct Non-Interactive Argument of Knowledge (zk-SNARK)	Zk-SNARK stands for “Zero-Knowledge Succinct Non-Interactive Argument of Knowledge”. It refers to a crypto-graphic proof construction that enables a prover to prove to a verifier knowledge of certain information, (for example, a secret key), without revealing that information, and without any interaction between the prover and verifier.

List of abbreviations

ALI	American Law Institute
BAYC	Bored Ape Yacht Club
BILETA	British and Irish Law, Education and Technology Association
BTC	bitcoin
CEA	Carbon emission allowances
CD	Compact disc
CLLS	The City of London Law Society
COMP	FCA Handbook Compensation Sourcebook
CRV	Curve DAO token
DAO	Decentralised autonomous organisation
DeFi	Decentralised finance
DLT	Decentralised ledger technology
DNS	Domain Name System
ENS	Ethereum Name Service
ETH	ether
ETS	Emissions Trading System
EUA	EU carbon emission allowance
EULA	End-user licence agreement
FCA	Financial Conduct Authority
FCARs	Financial Collateral Arrangements (No 2) Regulations 2003
FCD	European Union Financial Collateral Directive 2002/47/EC

FMI SAR	Financial Markets Infrastructure Special Administration Regime
FMLC	Financial Markets Law Committee
GUI	Graphical user interface
ICANN	Internet Corporation for Assigned Names and Numbers
IMAP	Internet Message Access Protocol
IP	Internet protocol
IPFS	InterPlanetary File System
ISDA	International Swaps and Derivatives Association
MMIs	Money market instruments
MMORPG	Massively multiplayer online role-playing game
NFT	Non-fungible token
TCP	Transmission Control Protocol
TLD	Top Level Domain
Liechtenstein Token Act	Liechtenstein's Token and TT Service Provider Act
LPA 1925	The Law of Property Act 1925
MX record	Mail Exchanger record
MUA	Mail User Agent
MTA	Mail Transfer Agent
POP	Post Office Protocol
SMTP	Simple Mail Transfer Protocol
UCC	Uniform Commercial Code (United States)
UKJT Statement	UK Jurisdiction Taskforce, Legal Statement on cryptoassets and smart contracts
ULC	Uniform Law Commission (United States)

UNIDROIT	The International Institute for the Unification of Private Law
UTXO	Unspent transaction output
URI	Uniform Resource Identifier
URL	Universal Resource Locator
USB	Universal Serial Bus
VCC	Voluntary carbon credits
HTTP	Hypertext Transfer Protocol

Chapter 1: Introduction

DIGITAL ASSETS

1.1 Digital assets are increasingly important in modern society. They are used for an expanding variety of purposes — including as valuable things in themselves, as a means of payment, or to represent or be linked to other things or rights — and in growing volumes. Electronic signatures, cryptography, smart contracts, distributed ledgers and associated technology have broadened the ways in which digital assets can be created, accessed, used and transferred. Such technological development is set only to continue.

The importance of personal property rights

1.2 This consultation paper considers principles of private law, and particularly private property law, in relation to digital assets. Property rights are vital to our social, economic and legal systems.[1] Property in this sense refers not to specific things themselves but to the social consensus between people as to how those things should be held, used, exchanged and protected.[2]

1.3 Property rights are important for many reasons. "Property law is default law" and so should apply to transactions relating to objects of property rights unless parties exclude its operation.[3] So property rights are a "gateway to many standard forms of transactions".[4] Property rights are useful because, in principle, they are recognised against the whole world, whereas other — personal — rights are recognised only against someone who has assumed a relevant legal duty.[5]

1.4 Hernando De Soto argues that this matters because:[6]

> Legal property is the indispensable process that fixes and deploys capital. [Without] property mankind cannot convert the fruits of its labour into fungible, liquid forms that can be differentiated, combined, divided, and invested to produce surplus value.

1.5 We consider that the advancement of digital asset related technology will exponentially expand the scope of this productive process — it could create "an

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1 M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-001.

2 See H De Soto, *The Mystery of Capital* (2000) p 164.

3 S Green, "Cryptocurrencies: The Underlying Technology", in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 1.20.

Professor Sarah Green is the Commissioner for Commercial and Common Law at the Law Commission of England and Wales, and lead Commissioner for this project.

4 D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.07.

5 UK Jurisdictional Taskforce, *Legal Statement on cryptoassets and smart contracts* (November 2019), https://technation.io/lawtechukpanel/ ("UKJT Statement") para 36.

6 See H De Soto, *The Mystery of Capital* (2000) p 164.

internet of property". In turn, this could facilitate more distributed and equitable access to property rights and to the legal recognition and protection they provide, allowing a more diverse range of people, groups and companies to interact online and to benefit more widely from their own productivity. Digital assets themselves enhance this process by enabling the communication of value via electronic means, which broadens the scope of and access to markets and increases the transferability, composability and liquidity of things of value. Legal property rights facilitate this process in a number of different ways (as noted by the UK Jurisdictional Taskforce in its Legal Statement on cryptoassets and smart contracts (the "UKJT Statement"):[7]

(1) The concept of property rights is widely used in statutes and cases and most commercial transactions relating to things of value involving property rights.

(2) Property rights are important for the proper characterisation of many modern and complex legal relationships, including custody relationships, collateral arrangements and structures involving trusts.

(3) Property rights are particularly important in an insolvency, where they generally have priority over claims by creditors.

(4) Property rights are important when someone seeks to recover something that has been lost, stolen, or unlawfully taken.

(5) Property rights are important for the purposes of the legal rules concerning succession on death, the vesting of property on personal bankruptcy and tracing in cases of fraud, theft or breach of trust.

Digital assets and personal property rights

1.6 Digital assets and methods for the transmission online of things that the market values have struggled to integrate themselves with the law of personal property. This is partly because of difficulties in translating property rights onto things that are information-based, easily shareable and open or available to all.

1.7 While there are many advantages to the open sharing of information, Professor Fairfield suggests that the historic failure of the private law to protect property rights in certain digital assets weakens legal protection for users:[8]

> In the context of the internet, we have imported the common law of contract wholesale, without the counterbalance of property law. As a result, emergent useful property forms are being eliminated by contract.

1.8 For a long time, this approach was understandable, because many digital assets do not exhibit the same characteristics as other objects of property rights. However, as digital asset technology has evolved, so have the ways in which digital assets replicate the primary characteristics of objects of property. Most famously, Bitcoin, a

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7 UKJT Statement paras 36 and 37. These arguments were explicitly referred to by Justice Gendall in *Ruscoe v Cryptopia Ltd (in liq)* [2020] NZHC 728, (2020) 22 ITELR 925 at [64].

8 J Fairfield, "Virtual property" (2005) 85 *Boston University Law Review* 1047, 1052.

"communications channel" which creates a "system for electronic transactions",[9] enables a native notional quantity unit[10] — bitcoin — to exist within, and as a result of, the Bitcoin system, and to replicate the primary characteristics of other objects of property rights. The law has already had to deal with this development.

1.9 We consider that the law of England and Wales has proven itself sufficiently resilient, flexible and iterative to accommodate digital assets. But we also think that certain aspects of the law now need reform to ensure that digital assets benefit from consistent legal recognition and protection.[11]

1.10 For example, the law already recognises that some digital assets can be objects of property rights. However, the law is still in the process of developing a sophisticated legal regime that recognises and protects the nuanced features of those digital assets. This consultation paper argues that it is now appropriate for private law to acknowledge those idiosyncratic features so that it can provide a strong, principled and conceptually-sound foundation, grounded in personal property rights,[12] from which to develop a coherent legal framework. In this way, the legal system, as part of a wider social framework, can reinforce the overall strength of digital asset environments (which also rely on social elements), provided that the legal system works in-sync with the technical elements of those digital asset systems. We consider that the law of England and Wales is well placed to do this.

1.11 This approach will ensure that the law of England and Wales remains a dynamic, highly competitive and flexible tool for market participants. The UK Government has suggested that this approach will also be reflected at the regulatory level.[13] If it is, we consider that the jurisdiction of England and Wales could become a global hub for digital assets, and in particular, crypto-tokens and crypto-token systems.[14]

1.12 This consultation paper does not therefore seek to create any sort of regulatory structure for any particular type of digital asset. Instead, our object is to create a

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9 S Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008) 1 and 8: https://nakamotoinstitute.org/bitcoin/.

10 Sometimes referred to as a "cryptocurrency".

11 Our work is globally relevant. The law of England and Wales has a global reach as the legal system of choice for many commercial parties: The Law Society, *England and Wales: a world jurisdiction of choice* (2019).

12 We consider that grounding the law in principles of personal property rights will provide individuals with effective and flexible legal mechanisms with which to protect their assets. It will also facilitate their individual autonomy and ability to use their assets as capital to participate within formalised legal structures. See F Braudel, *Civilization and capitalism, 15th - 18th Century: The Wheels of Commerce* (1992) p 248 and H De Soto, *The Mystery of Capital* (2000) p 1.

13 "We shouldn't be thinking of regulation as a static, rigid thing. Instead, we should be thinking in terms of regulatory 'code' … like computer code… which we refine and rewrite when we need to… tailored and proportionate, yes… but also nimble and tech-neutral… shaped by your input and advice… and with the Treasury and regulators, through the Cryptoassets Taskforce, working together to create a dynamic regulatory landscape which works for everyone." See, Keynote Speech by John Glen MP Economic Secretary to the Treasury, at the Innovate Finance Global Summit during Fintech Week 2022: https://www.gov.uk/government/speeches/keynote-speech-by-john-glen-economic-secretary-to-the-treasury-at-the-innovate-finance-global-summit.

14 A stated ambition of the UK Government: see the Keynote Speech by John Glen MP referred to above.

facilitative and legally certain environment in which such assets can flourish. This is distinct from other initiatives which seek to regulate any resultant economic activity.

The structure of this paper

A distinct third category of personal property

1.13 In this consultation paper, we begin by explaining the general features of personal property law. We go on to consider how information is treated under the law of England and Wales and describe why information is not an appropriate object of property rights.

1.14 We explain that the law has traditionally recognised two categories of personal property — things in possession and things in action — neither of which accommodates digital assets comfortably. We demonstrate that some digital assets nevertheless have the characteristics of other objects of property rights.

1.15 We go on to make a provisional proposal for law reform that would explicitly recognise a category of personal property distinct from things in possession and things in action. We call this third category of personal property "data objects". We distinguish data objects from pure information, which we consider ought not attract property rights.

1.16 Having suggested that the law should explicitly recognise a distinct third category of personal property, we describe the criteria that we consider a thing must exhibit before it properly can fall within that third category and thereby constitute a data object. We apply these criteria to different types of digital asset including digital files, domain names, email accounts, in-game digital assets, carbon credits and crypto-tokens.

1.17 Although we provisionally propose law reform, we set out two options for the development and implementation of our proposals — iterative, common law reform or (limited) statutory intervention. We outline the potential benefits and drawbacks for each, but do not conclude with a preferred option. Instead, we ask consultees for their views.

Consequential legal developments

1.18 Having made and explained our central proposal for law reform we then discuss a number of other areas in which further legal certainty might be facilitated, generally by illustrative references to existing market practice relating to crypto-tokens.

1.19 First, we consider a fundamental factual relationship that a person can have with a data object — control.[15] Rather than using the factual concept of control as a definitional characteristic of data objects,[16] we instead consider how it might be best thought of as an important element of the way in which persons can interact with the object in question.

1.20 We discuss this idea as part of a wider consideration of important legal frameworks for data objects (specifically, crypto-tokens). We consider how factual transfers of crypto-

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[15] We argue that the concept of control, though in many ways equivalent to the concept of possession, is the more appropriate concept to apply to data objects.

[16] For example, some law reform initiatives use the term controllable electronic record.

tokens operate. We then discuss how a legal transfer of a crypto-token might operate, by reference to principles of original and derivative acquisition of title. Importantly, we provisionally propose the introduction of an innocent-acquirer rule for crypto-tokens.

1.21 We go on to consider how custody (and custody-like) arrangements can be structured — specifically in relation to crypto-tokens. We provisionally propose a number of ways in which the law should be reformed in this area.

1.22 We also consider current legal problems in the structuring of collateral arrangements in respect of crypto-tokens and consider further options for law reform in this area, without suggesting specific law reform. Finally, we discuss how existing causes of action and associated remedies can apply to crypto-tokens.

Our proposals for law reform

1.23 Much of this consultation paper contains explanations of the characteristics of certain categories of digital assets. It also sets out reasoning and justification for the existing legal analysis in respect of those digital assets, and commentary on current market practice in relation to them. We make few proposals for law reform because we consider that the common law of England and Wales is, in general, sufficiently flexible to accommodate digital assets.[17]

1.24 Nevertheless, the provisional law reform proposals that we do make are foundational and seek to build on existing principles of private personal property law. We consider that these proposals will enable the courts to continue to iterate and innovate in the same way they have done since the publication of the UKJT Statement,[18] which we consider has become a fundamental and foundational part of the law of England and Wales in this area.

1.25 Where we make provisional proposals for law reform, we ask consultees whether they agree. We are also interested in receiving comments on our general analysis of the current state of affairs in terms of law and practice, and ask some general questions to enable consultees to share their views with us.

1.26 We do not consider regulation of crypto-tokens and other digital assets, which is dealt with by other bodies including HM Treasury and the Financial Conduct Authority ("FCA").

1.27 In this consultation paper we necessarily make reference to current and former digital assets, crypto-tokens, crypto-token platforms, businesses and applications. These references are for illustrative purposes or to assist in the explanation of hypothetical examples only. By using these examples to explain the principles and concepts in the paper, we are not making any comments on the underlying terms and conditions of particular projects, except by reference to existing law and our proposals for law

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[17] See Sir Geoffrey Vos (speaking extra-judicially): "We should try to avoid the creation of a new legal and regulatory regime that will discourage the use of new technologies rather than provide the foundation for them to flourish." Sir Geoffrey Vos, "Cryptoassets as property: how can English law boost the confidence of would-be parties to smart legal contracts?" (2 May 2019) Joint Northern Chancery Bar Association and University of Liverpool Lecture, https://www.judiciary.uk/wp-content/uploads/2019/05/Sir-Geoffrey-Vos-Chancellor-of-the-High-Court-speech-on-cryptoassets-2.pdf.

[18] UKJT Statement.

reform. We also note that our analysis is usually restricted to individual terms and has narrowly defined purposes. It is thus necessarily not reflective of the wider legal agreements or characterisation of specific projects, project terms or the overall legal consequences or effects of such terms.

ABOUT THIS PROJECT

Background

1.28 The Law Commission first looked at areas of emerging legal technology, and smart contracts in particular, in 2018.[19] Our early research suggested that we would need to consider digital assets as part of this work.

1.29 The UKJT published the UKJT Statement in November 2019.[20] The UKJT Statement contained a detailed and accurate account of the current law in relation to crypto-tokens, which was subsequently adopted by the courts of England and Wales, as well as other common law jurisdictions.[21]

1.30 As well as our existing work on smart contracts,[22] the UK Government subsequently asked the Law Commission to undertake two separate pieces of related work on digital assets.

(1) Digital assets: to review the law on crypto-tokens and other digital assets more generally, and consider what reforms are needed to ensure that the law of England and Wales can accommodate such assets.

(2) Electronic trade documents: to make recommendations to enable the legal recognition of certain trade documents in electronic form.

1.31 The two phases of our work, while distinct, involve similar legal concepts. This consultation paper relates only to the "digital assets" part of our work, although we make multiple references to our report on electronic trade documents which was published in March 2022.[23]

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19 A project on smart contracts was included in the Law Commission's 13th programme of law reform, published in December 2017. We paused our work on smart contracts pending the outcome of similar work being done by the Lawtech Delivery Panel's UK Jurisdiction Taskforce ("UKJT"), set up in conjunction with the Ministry of Justice and chaired by the (then) Chancellor of the High Court of England and Wales, Sir Geoffrey Vos.

20 UKJT Statement.

21 The UKJT Statement was cited by courts in England and Wales, in cases including *AA v Persons Unknown* [2019] EWHC 3556 (Comm), [2020] 4 WLR 3 at [56]-[61] and *Ion Science v Persons Unknown* (21 December 2020, unreported) at [11]; in New Zealand, in *Ruscoe v Cryptopia* [2020] NZHC 728, [2020] 22 ITELR 925 (New Zealand High Court) at [21] and [64]; and in Singapore, in *Quoine pte v B2C2* [2020] SGCA(I) 02 (Singapore Court of Appeal) at [143].

22 Smart legal contracts: advice to Government (2021) Law Com No 401.

23 More information and the latest updates are available at https://www.lawcom.gov.uk/project/electronic-trade-documents/.

Terms of reference

1.32 In March 2020, the Ministry of Justice asked the Law Commission to set out the current law in relation to crypto-tokens and digital assets and make recommendations to ensure that the law is capable of accommodating crypto-tokens and digital assets, including whether they should be capable of "possession".

1.33 Our full terms of reference are included at Appendix 1.

Call for evidence and interim update paper

1.34 We published a call for evidence on digital assets on 30 April 2021. The purpose of the call for evidence was to give stakeholders and market participants an opportunity to provide their input to us ahead of this formal consultation paper. It sought views about, and evidence of, the ways in which digital assets are being used, treated and dealt with by market participants. It also sought views on the potential consequences of digital assets being deemed to be "things in possession" alongside traditional tangible assets.

1.35 We received 37 responses to the call for evidence from a range of stakeholders including practising lawyers, academics, technologists, and commercial entities. We considered the responses in detail and have developed our thinking to reflect many of the points raised by respondents.

1.36 We published an interim update paper on our digital assets project on 24 November 2021. This included an update on the scope and detail of our work, reflecting the responses to the call for evidence. In particular, we noted two developments in our thinking:

(1) The call for evidence used "digital assets" in an intentionally broad sense. Many respondents suggested that the next phase of our work should distinguish between different sub-categories of digital asset, such as digital files, domain names, in-game digital assets and crypto-tokens. This paper brings out those distinctions further.

(2) Many respondents to the call for evidence argued that possession and possessory concepts were not the most appropriate legal tools for dealing with digital assets or sub-categories thereof, and urged an approach that would recognise more accurately the idiosyncrasies of digital assets. We considered these comments carefully and in this paper we provisionally propose the explicit recognition of a "third category" of personal property. We also consider the arguments for and against applying the concept of possession to certain digital assets, and provisionally conclude that the distinct, but related concept of control (as described in this consultation paper) is more appropriate.

1.37 Throughout this consultation paper, we draw on key points made by respondents to the call for evidence, and representations made to us since. A list of respondents to the call for evidence, and other people and organisations to whom we have spoken, is included at Appendix 2.

Territorial extent

1.38 As the Law Commission for England and Wales, we can only make law reform proposals and recommendations for England and Wales. This paper considers primarily matters of private law, which are devolved in Scotland and transferred in Northern Ireland. In addition, there are important differences between the law of personal property in England and Wales and its equivalent in Scots law. This paper does not seek to identify those differences and does not address Scots law or the law of Northern Ireland.

Related current and upcoming Law Commission work

1.39 We have recently been asked by Government to undertake two further projects which are related to our current work on digital assets. We expect to start both within the next few months.

Conflict of laws

1.40 Our work on smart legal contracts, digital assets, and electronic trade documents has identified several private international law issues. These include ascertaining the law applicable to a dispute, and determining whether a particular court will have jurisdiction to hear a dispute in relation to a smart legal contract or digital asset. With digital assets and smart legal contracts having become so common in the "virtual world", there are inherent difficulties in determining the geographical location of acts, actors, and data objects. For example, when a digital asset is hosted on a decentralised, distributed ledger, where is it located? And, if transferred or misappropriated, where has it moved from, and where has it moved to?

1.41 We agreed with Government that we will undertake a project looking at the rules relating to conflict of laws as they apply to emerging technology, including smart legal contracts and digital assets, and consider whether reform is required.[24]

Decentralised autonomous organisations ("DAOs")

1.42 DAOs are a novel form of online, decentralised organisational structure. They are generally member-led, with bespoke governance and some form of treasury (often denominated in crypto-tokens). They are increasingly important in the context of crypto-token systems and many DAOs hold assets of significant value, but their legal, regulatory and tax status is unclear.

1.43 The Law Commission has been asked to undertake a 15-month scoping study to explore and describe the current treatment of DAOs under the law of England and Wales. That project will identify options for how DAOs should be treated in law in the future in a way which would clarify their status and facilitate their uptake.[25]

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[24] More information and the latest updates are available at https://www.lawcom.gov.uk/project/conflict-of-laws-and-emerging-technology/.

[25] More information and the latest updates are available at https://www.lawcom.gov.uk/project/decentralised-autonomous-organisations-daos/.

OTHER WORK ON DIGITAL ASSETS

1.44 Given the importance of digital assets (and in particular the importance and market scale of crypto-tokens) to the modern world, many jurisdictions and institutions have law reform initiatives which relate to digital assets.

1.45 For example, the UNIDROIT Digital Assets and Private Law Working Group ("the UNIDROIT Working Group") is developing a set of international principles designed to facilitate transactions in digital assets.[26] The purpose of the Working Group is to describe proprietary principles that apply to transactions and legal arrangements involving certain digital assets.

1.46 Similarly, in the United States, the American Law Institute and the Uniform Law Commission's Uniform Commercial Code and Emerging Technologies Committee (the "ULC") is in the process of recommending changes to the United States Uniform Commercial Code ("UCC").[27] The proposed amendments include a new UCC Article 12 that would govern the transfer of property rights in certain intangible digital assets that have been or may be created using new technologies.[28]

1.47 The Law Commission sits as an observer on both the UNIDROIT Working Group and the ULC Committee and we are very grateful for the input and advice we received from the teams working on those projects.

1.48 In addition, in recent years, there have been several UK initiatives to analyse the implications of the development of digital assets and specifically cryptoassets.[29] These include:

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26 See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 1: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf. UNIDROIT is an intergovernmental organisation whose objective is to harmonise international private law across countries through uniform rules, international conventions, and the production of model laws, sets of principles, guides and guidelines.

27 The American Law Institute ("ALI") and the ULC formed a joint committee in 2019 to review the UCC with a view to recommending amendments or revisions to accommodate emerged and emerging technological developments. The ULC is a non-profit unincorporated association, comprised of state commissions on uniform laws from each US state. Its purpose is to review state law to determine which areas of law should be uniform, and to provide states with non-partisan, draft legislation for implementation across the United States, where necessary. Both the ALI and the ULC have now approved the proposed amendments to the UCC and the amendments will now be promulgated for consideration by the various states. See: https://www.uniformlaws.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=67fe571b-e8ad-caf8-4530-d8b59bdca805.

28 These assets are defined as "controllable electronic records" and include, for example, certain types of virtual currency and nonfungible tokens. See Uniform Law Commission, *Draft - Uniform Commercial Code and Emerging Technologies - 2022 May 16-18 Meeting* p 3: https://www.uniformlaws.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=fa5c6c1b-c612-c453-b39d-8b4e3e8496f3.

29 As defined in those respective projects.

(1) the HM Revenue and Customs Cryptoasset Manual[30] and the HM Revenue and Customs Call for evidence: the taxation of decentralised finance involving the lending and staking of cryptoassets;[31]

(2) guidance produced by the Financial Conduct Authority;[32]

(3) the HM Treasury Consultation on cryptoassets and stablecoins;[33] and

(4) the analysis by the Bank of England of cryptoassets and financial stability.[34]

ACKNOWLEDGEMENTS AND THANKS

1.49 In Appendix 2 to this consultation paper, we provide a list of those who responded to the call for evidence, together with a list of stakeholders with whom we have met during the project so far. We are very grateful to all those who took the time to respond to the call for evidence, or who have otherwise met with us or responded to other requests for assistance or information in support of this work.

1.50 We are also extremely grateful for the feedback and comments from an Advisory Panel of experts, who have commented on drafts of our work and shared their expertise and evidence with us. Their names are listed in Appendix 2. The contents of this consultation paper and the provisional conclusions we reach are not intended to represent, and may not be reflective of, the personal views of Advisory Panel members.

THE STRUCTURE OF THIS CONSULTATION PAPER

1.51 This consultation paper comprises 19 further chapters and 6 appendices.

(1) In Chapter 2, we summarise the existing law of personal property and describe the principles used by the existing law to help determine when a thing can be the object of property rights.

(2) In Chapter 3, we discuss information and the reasons why the law of England and Wales does not, in general, treat information as a thing that can attract property rights. We include this detailed consideration of information to ground our consultation paper on the principle that information ought not attract property rights. We do so because this consultation paper goes on to suggest that certain digital assets that are constituted, in part, of data are so distinct from information that the law can treat them as objects of property rights.

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30 See https://www.gov.uk/hmrc-internal-manuals/cryptoassets-manual.

31 See https://www.gov.uk/government/consultations/call-for-evidence-the-taxation-of-decentralised-finance-involving-the-lending-and-staking-of-cryptoassets.

32 Financial Conduct Authority, "Cryptoassets: our work": https://www.fca.org.uk/firms/cryptoassets.

33 See https://www.gov.uk/government/consultations/uk-regulatory-approach-to-cryptoassets-and-stablecoins-consultation-and-call-for-evidence.

34 Bank of England Financial Policy Committee, "Financial Stability in Focus: Cryptoassets and decentralised finance" (March 2022): https://www.bankofengland.co.uk/-/media/boe/files/financial-stability-in-focus/2022/cryptoassets-and-decentralised-finance.pdf.

(3) In Chapter 4, we describe two existing categories of personal property under the law of England and Wales: things in possession and things in action. We explain why we do not consider that some digital assets should be considered either things in possession or things in action. We provisionally propose that the law should formally recognise a third category of personal property.

(4) In Chapter 5, we consider what characteristics a digital asset would have to have before it is capable of being an object of property rights and of falling within our proposed third category — data objects. We call these our "criteria". We describe two options for the development and implementation of our law reform proposals — iterative, common law reform or (limited) statutory intervention. We outline the potential benefits and drawbacks for each, but do not conclude with a preferred option. Instead, we ask consultees for their views.

(5) Chapters 6 to 10 are relatively short chapters, each of which applies our proposed criteria to one of the following sub-sets of digital assets:

(a) digital files and digital records (Chapter 6);

(b) email accounts and in-game digital assets (Chapter 7);

(c) domain names (Chapter 8);

(d) carbon emissions trading schemes[35] (Chapter 9); and

(e) crypto-tokens (Chapter 10).

(6) In Chapter 11 we consider whether the concept of possession can apply to data objects. We conclude that the concept of control, though in many ways equivalent to possession, is the more appropriate concept to apply to data objects. We propose a factual concept of control and go on to consider how that broad concept of control might be best thought of as an important constituent element of a higher-level organising or framing principle in the context of certain complex legal mechanisms or structures.

(7) In Chapter 12 we discuss the idiosyncratic technical features of a factual transfer of a crypto-token.

(8) In Chapter 13 we consider how legal transfers of crypto-tokens operate. We discuss this by reference to a factual transfer of a crypto-token, the legal principles of original and derivative acquisition of title and the factual concept of control. We go on to propose the introduction of an innocent-acquirer rule for crypto-tokens. We conclude by drawing analogies between the legal transfer of crypto-tokens and other methods of legal transfer recognised by the law of England and Wales.

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[35] We apply our criteria to these schemes to illustrate by way of analogy how our analysis might apply to other similar intangibles, such as waste management licences or milk quotas.

(9) In Chapter 14 we consider the different ways in which a crypto-token might be linked to something else — normally a thing external to a crypto-token system — including the potential legal consequences of such a link.

(10) In Chapter 15 we apply some of our reasoning in earlier chapters to "non-fungible tokens" ("NFTs") and discuss some specific legal issues that might arise in respect of NFTs.

(11) In Chapter 16 we analyse how custody (and custody-like) arrangements in respect of crypto-tokens can be structured under the law of England and Wales.

(12) In Chapter 17 we make some limited law reform proposals in respect of certain legal issues that arise in respect of custody arrangements for crypto-tokens.

(13) In Chapter 18, we consider how collateral arrangements in respect of crypto-tokens can be structured under the law of England and Wales. We make some suggestions for further law reform work in this area, but acknowledge that such work lies beyond the scope of this project.

(14) In Chapter 19 we consider how existing causes of action and associated legal remedies might operate in respect of crypto-tokens.

(15) In Chapter 20, we include a full list of consultation questions.

1.52 Appendix 1 sets out our full terms of reference for this work.

1.53 Appendix 2 includes a list of our advisory panel members, a list of respondents to our call for evidence, and the stakeholders with whom we have met or corresponded in the development of this paper.

1.54 Appendix 3 includes a more detailed consideration of some functions of crypto-tokens, including by reference to different technical implementations of crypto-tokens and crypto-token systems.

1.55 Appendix 4 includes a short-form description of a crypto-token with accompanying commentary. The description in Appendix 4 has also been uploaded to GitHub at https://github.com/LawCommissionofEnglandandWales/Crypto-token-definition where consultees can comment on the description directly.

1.56 Appendix 5 describes, at a very high level, the principal features of Layer 2 scaling solutions and includes some brief and tentative commentary on how such solutions might fit within the property law analysis contained in this consultation paper.

1.57 Appendix 6 reproduces (with permission) the high-level descriptions of cryptoassets (as defined therein) and distributed ledger technology that were annexed to the UKJT public consultation on cryptoassets and smart contracts.

The team working on this paper

1.58 The following members of the Commercial and Common Law team have worked on this project: Laura Burgoyne (team manager), Matthew Kimber (team lawyer), Amila Kulasinghe (team lawyer), Daniella Lupini (team lawyer), Diana Stoean (research

assistant), Caroline Jackson (research assistant), William Vaudry (research assistant) and Tim Koch (research assistant). Additional support has been provided by team lawyer Nathan Tamblyn and research assistants James Taylor, Aparajita Arya and Matthew Freeman.

Chapter 2: Objects of personal property rights

WHAT DO WE MEAN WHEN WE TALK ABOUT PROPERTY?

2.1 Before considering whether a digital asset can be the object of property rights, it is helpful to describe the legal concept of property.

2.2 Any consideration of property law normally begins with the admission that it is a complex and multi-faceted subject. Justice Edelman summarises the issue:[36]

> The first problem in any analysis of property rights is the lack of any coherent definition of 'property'.

2.3 Colloquially, we use the term property interchangeably to describe both a thing, and a claim or entitlement to that thing. However, in a stricter legal sense, the term property describes a relationship between a person and a thing, and not the thing itself.[37] For example, in the phrase "that phone is my property", the object (the thing) is the mobile phone. The property rights are the rights that a person has in relation to that mobile phone.

2.4 But even in legal writing such as academic papers, cases and statutes, the term property is sometimes used in its broader, more colloquial sense or as a shorthand term. In this consultation paper, we generally refer to "an object of property rights", although we do use the term property in its more colloquial or shorthand sense in some places.

2.5 In law, property is divided into the categories of real property and personal property. Real property refers to interests in land, while personal property refers to interests in relation to any other thing.[38] Our work concerns the principles of personal property.

DEFINITIONS OF PROPERTY IN STATUTE AND COMMON LAW

2.6 There is no single, statutory definition of property under the law of England and Wales. Different statutes take different approaches to defining it. For example, the

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[36] J Edelman, "Property Rights to Our Bodies and Their Products" (2015) 39(2) *University of Western Australia Law Review* 47, 52.

[37] Property has been described as "not a thing at all but a socially approved power-relationship in respect of socially valued assets": see K Gray, "Equitable Property" (1994) 47(2) *Current Legal Problems* 157, 160. We discuss this description in detail later in this chapter.

[38] M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-009.

Insolvency Act 1986 gives the term property a broad meaning.[39] Other statutes, including the Theft Act 1968, use similarly broad definitions.[40]

2.7 The above statutes each use a broad definition of property to achieve particular policy purposes. In the Insolvency Act 1986, the definition has the widest meaning,[41] with the broad purpose of maximising the extent of the insolvent estate — the insolvent company's assets[42] — available to repay creditors.[43] Under the Theft Act 1968, a broad definition is used to ensure that protection[44] of property from theft is as wide as possible. However, these definitions are not free from difficulty. One problem is that they are circular: property is defined to include "every description of property" in the Insolvency Act 1986 and "all other property" in the Theft Act 1968.[45] So, these statutory definitions alone do not shed further light on the nature of the concept of property itself.[46] Some statutes, on the other hand, deliberately narrow the scope of the term property. For example, the Torts (Interference with Goods) Act 1977 excludes "things in action and money".[47] This makes sense for the purposes of the statute itself, which focuses on interferences with tangible goods. But it is not helpful in determining a general statutory meaning of the term.

2.8 Nor is there a single definition of property at common law. Instead, courts tend to approach the issue of whether a thing can attract property rights on a case-by-case basis, considering whether the particular thing in question is property for the particular purpose in question.[48] Lord Wilberforce took this approach in *National Provincial Bank v Ainsworth*,[49] in which he set out a list of the characteristics of property. We return to these characteristics of property at paragraph 2.37 below.

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39 The definition of property in s 436 Insolvency Act 1986 is: "'property' includes money, goods, things in action, land and every description of property wherever situated and also obligations and every description of interest, whether present or future or vested or contingent, arising out of, or incidental to, property."

40 The definition of property in s 4(1) Theft Act 1968 is: "'Property' includes money and all other property, real or personal, including things in action and other intangible property". See also s 5(2) Theft Act 2006 and s 68(11) of the Trustee Act 1925, which contain similarly broad definitions of "property".

41 R Goode, K van Zwieten, *Goode on Principles of Corporate Insolvency Law* (5th ed 2018) para 6-03. The authors of *The Law of Personal Property* suggest that "a broader definition is difficult to imagine": see M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-078.

42 Rule 1.2(2) Insolvency (England and Wales) Rules 2016.

43 See D Milman, P Bailey, *Sealy & Milman: Annotated Guide to Insolvency Legislation* (24th ed 2021) vol 1 part XVIII para 436.

44 The law provides 'protection' from theft indirectly in a number of ways, including discouraging theft by imposing sanctions on those who commit it, and providing legal remedies in respect of stolen property.

45 R Goode, K van Zwieten, *Goode on Principles of Corporate Insolvency Law* (5th ed 2018) para 6-03.

46 M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-002.

47 Torts (Interference with Goods) Act 1977, s 14(1). See also eg *Colonial Bank v Whinney* (1886) 11 App Cas 426 in which the court considered whether shares in an incorporated company were "things in action" within the meaning of the Bankruptcy Act 1883."

48 UK Jurisdictional Taskforce, *Legal Statement on cryptoassets and smart contracts* (November 2019), https://technation.io/lawtechukpanel/ ("UKJT Statement") para 39. This approach has also been followed in recent cases related to crypto-tokens, which we discuss in more detail below in Chapter 4.

49 [1965] AC 1175.

2.9 While courts have treated Lord Wilberforce's characteristics as important indicia,[50] the characteristics themselves are not capable of precise definition, nor are they exhaustive.[51] The authors of the *Law of Personal Property* refer to the characteristics as "better regarded as a framing device rather than a test [in themselves]".[52] Indeed, over time, others have built on and developed those characteristics.[53]

A CONCEPT OF PROPERTY

2.10 This consultation paper endorses an understanding of property as "not a thing at all but a socially approved power-relationship in respect of socially valued assets, things or resources".[54]

2.11 This concept of property was discussed and approved by the High Court of Australia in *Yanner v Eaton*:[55]

> "property" does not refer to a thing; it is a description of a legal relationship with a thing. It refers to a degree of power that is recognised in law as power permissibly exercised over the thing.

2.12 The UK Jurisdictional Taskforce, Legal Statement on cryptoassets and smart contracts ("UKJT Statement") adopted the *Yanner v Eaton* description of property.[56] Similarly, the authors of *The Law of Personal Property* endorse Professor Gray's

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50 These characteristics were applied by the Court of Appeal in *Gray v Global Energy Horizons Corp* [2020] EWCA Civ 1668 at [460] to [461], when considering whether a business opportunity constitutes property. The characteristics were also applied in *AA v Persons Unknown* [2019] EWHC 3556 (Comm), [2020] 4 WLR 35; *Ruscoe v Cryptopia Ltd (in liq)* [2020] NZHC 728, (2020) 22 ITELR 925; *Quoine Pte Ltd v B2C2 Ltd* [2019] SGHC(I) 3, [2019] 4 SLR 17; and *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10, [2013] Ch 156. In *Kennon v Spry* [2008] HCA 56, (2008) 238 CLR 366 at [162], the High Court of Australia said that "Lord Wilberforce's statement has been approved more than once in this court", referring to *R v Toohey; Ex parte Meneling Station Pty Ltd* [1982] HCA 69 and *Australian Capital Television Pty Ltd v The Commonwealth* (1992) 177 CLR 106 at 165.

51 UKJT Statement para 40.

52 M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-004.

53 Other characteristics of property that have been suggested include:

(1) "capable of possessing realisable value": R Goode, K van Zwieten, *Goode on Principles of Corporate Insolvency Law* (5th ed 2018) paras 6-03 and 6-15; see also *In Re Celtic Extraction Ltd* [2001] Ch 475 at 489 by Morritt LJ;

(2) "excludability": K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal* 251; D Fox, "Cryptocurrencies in the Common Law of Property", in S Green, D Fox, *Cryptocurrencies in Public and Private Law* (2019) para 6.22; and

(3) "exigibility": J Sarra, L Gullifer, "Crypto-claimants and bitcoin bankruptcy: Challenges for recognition and realization" (2019) 28(2) *International Insolvency Review* 233, 243; P Birks, *An introduction to the law of restitution* (1985) pp 49 to 50; M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) paras 1-005 to 1-008.

54 K Gray, "Equitable Property" (1994) 47(2) *Current Legal Problems* 157, 160. We would include legal endorsement within the wider concept of social endorsement. Gray uses the terms "things" and "resources" in K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal*: "[property is] a legally endorsed concentration of power over things and resources".

55 (1999) 201 CLR, referring to K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal* 251.

56 UKJT Statement para 35.

observation that "the law of property is concerned with entire networks of legal relationships existing between individuals in respect of things".[57] We think that this concept is useful for understanding how certain digital assets can be "assets, things or resources" that can be the object of socially approved power relationships.

2.13 Starting from the concept of property as a socially-approved power relationship in respect of socially-valued assets, things or resources, Professor Hannah Yee-Fen Lim asks: "What sort of power?".[58] In *Western Australia v Ward*, the High Court of Australia considered a similar question and said:[59]

> The common law's concern [is] to identify property relationships between people and things as rights of control over access to, and exploitation of, a thing.

2.14 A similar characterisation of the power relationship between persons and things also appears (in the context of a right to possession of land) at paragraph 52 of the judgment:[60]

> It is necessary to recognise that the holder of a right, as against the whole world, to possession of land, may control access to it by others and, in general, decide how the land will be used.

2.15 This formulation of the power relationship between persons and things was considered and cited with approval by Lord Neuberger[61] in his judgment in the Court of Appeal case of *Mayor of London v Hall*.[62]

2.16 In short, the formulation suggests that the legal construct of property consists of three principal elements.[63]

(1) First, the existence of an asset, thing or resource to which a power or right can relate.[64]

(2) Second, the liberty of a person to use the asset, thing or resource.[65]

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57 M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-003, referring to K Gray, S Gray, *Elements of Land Law* (5th ed 2008) p 6.

58 H Y-F Lim, "Is an email account property?" (2011) 1 *Property Law Review* 59, 62.

59 (2002) 213 CLR 1, [2002] HCA 28 at [88]. In that case, the judgment referred to "places or things". We removed the reference to places.

60 *Western Australia v Ward* (2002) 213 CLR 1, [2002] HCA 28 at [52].

61 When he was Master of the Rolls.

62 [2010] EWCA Civ 817, [2011] 1 WLR at [21]. Again, the case involved a statutory right to seek possession of land.

63 See also H Y-F Lim, "Is an email account property?" (2011) 1 *Property Law Review* 59, 62, in which Professor Hannah Yee-Fen Lim identifies the same three criteria.

64 As we discuss below, the asset, thing or resource is likely to exhibit the characteristics described by Lord Wilberforce in *National Provincial Bank v Ainsworth* [1965] AC 1175 at 1247 and 1248.

65 J Edelman, "Property Rights to Our Bodies and Their Products" [2015] 39(2) *University of Western Australia Law Review* 47, 53.

(3) Third, the right of a person either to exclude or allow access by another person to that particular asset, thing or resource.[66]

2.17 The second and third elements are sometimes combined into a single description. Professor Penner expresses this as:[67]

> The right to property is a right to exclude others from things which is grounded in the interest we have in the use of things.

2.18 In the Australian High Court case *Hocking v Director-General of the National Archives of Australia*,[68] Justice Edelman said that "a mere liberty to use a [thing] is neither necessary nor sufficient for a property right."[69] It is clear that the liberty to use a thing might in some cases be fettered, or constrained. For example, in *Yearworth v North Bristol NHS Trust*,[70] the liberty of men to use their frozen sperm samples was constrained by provisions in the Human Fertilisation and Embryology Act 1990. However, this did not preclude the existence of a property right in the sperm. The men still had the ability to prevent unwanted use of the samples, and retained an exclusive right to exclude others from using them.

2.19 The judgment in *Yearworth* notes that there are many limitations on people's liberty to use their property, citing as an example limitations on a pharmacist's liberty to sell medicine.[71] Likewise, in *Club Cruise Entertainment v Department of Transport*,[72] the ability of cruise ship owners to use the ship was constrained by a notice of detention issued due to suspicions of a norovirus outbreak. Nonetheless, there was no question that the ship remained an object of property rights.

2.20 In this sense, we recognise that a liberty to use a thing is not strictly necessary or sufficient to create a property right in that thing. However, we adopt the reasoning that a right to exclude others is, in general, grounded in the interest we have in the use of things.[73] As such, we treat the liberty to use a thing as a separate building block of a property right that interrelates with other elements of that right.

2.21 This concept could also be expressed differently: that the legal concept of a property right in an object is based on the ability to exclude others from that object, and the

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66 M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-006. As Professor Penner notes, the contours of this exclusionary right are provided by corresponding duties *in rem* [in the thing] that is imposed on others generally, see J E Penner, *The Idea of Property in Law* (1997) p 71. See also K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal* 251, 294. See also B McFarlane and S Douglas, "Property, Analogy, and Variety" (2022) *Oxford Journal of Legal Studies* 161, 166 in which the authors suggest that "[A person's] 'right to exclude', as a set of claim-rights *prima facie* binding on the rest of the world, correlates to duties owed by the rest of the world to [that person]".

67 J E Penner, *The Idea of Property in Law* (1997) p 71. Penner calls this the "exclusion thesis".

68 [2020] HCA 19.

69 *Hocking v Director-General of the National Archives of Australia* [2020] HCA 19, at [204].

70 *Yearworth v North Bristol NHS Trust* [2009] EWCA Civ 37, [2009] 2 All ER 986.

71 *Yearworth v North Bristol NHS Trust* [2009] EWCA Civ 37, [2009] 2 All ER 986 at [45](f)(ii).

72 [2008] EWHC 2794 (Comm), [2009] 1 Lloyd's Rep 201.

73 See J E Penner, *The Idea of Property in Law* (1997) p 71.

corresponding imposition of duties on others not to interfere with that object.[74] Viewed in this sense, the "liberty to use" a thing might be a practical and logical consequence of the combination of those elements, rather than being a necessary or sufficient element of property rights in itself.

2.22 We think that considering the legal construct of property by reference to the three elements described at paragraph 2.16 above makes it easier to examine whether a digital asset can be the object of property rights. In Chapters 6 to 10, we discuss in greater detail how these concepts can be applied to different types of digital assets, including crypto-tokens.

2.23 If an object can attract property rights, our wider social and legal systems will then function to recognise, protect, and reinforce the property relationships between a person and that object. These systems achieve this in two broad ways:

(1) They create a system for identifying who has the liberty to use a thing.[75]

(2) They recognise and protect a person's liberty to use a thing through the creation and acknowledgement of legal rights and corresponding impositions of duties on others.

2.24 Whether a thing attracts property rights is important because of the "universality" of property rights. Legal property rights are special because they can be asserted against the world at large and not, for example, only against an individual such as a contracting partner.[76]

2.25 We explore each of the elements of the legal construct of property in further detail below.

AN ASSET, THING OR RESOURCE

2.26 As we suggest, "property" does not refer to a thing but to a relationship between a person and a thing. Nevertheless, a necessary starting point is to identify what kind of

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74 See Justice Edelman in *Hocking v Director-General of the National Archives of Australia* [2020] HCA 19, at 204: "a property right to tangible goods should eschew metaphors and avoid conflation of different juristic concepts by being expressed simply as the right to exclude others or, by a correlative, as a duty upon those others not to interfere physically with the [thing]." See, however, M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-006, in which the authors suggest that the right to exclude others is just "*one aspect, albeit an important aspect of property in both tangible and intangible personal property*."

75 In this sense, property systems have been described as "a way of recording the state of resource distribution in a society", see J Fairfield, "Bitproperty" (2015) 88 *South California Law Review* 805, 871, citing W J Luther, J Olsen, "Bitcoin is Memory" (2015) 3 *Journal of Prices and Markets* 22, 23; N Kocherlakota, N Wallace, "Incomplete Record Keeping and Optimal Payment Arrangements (1998) 81 *Journal of Economic Theory* 272, 273; and N Kocherlakota, "Money is Memory" (1998) 81 *Journal of Economic Theory* 232, 233.

76 See M Bridge, *Personal Property Law* (4th ed 2015) p 2.

"things" can be the object of property rights, because the relationship is not one that can arise between persons and all things.[77]

2.27 Identifying a thing for the purposes of property law involves explaining the "legal mode of existence"[78] of that thing. In other words, property law can operate to "separate out and depersonalize a chunk of the world", by treating that chunk of the world as a "thing" that can be the object of property rights.[79]

2.28 While it is tempting to think of "thingness" as a self-evident quality, it is surprisingly difficult to identify the boundaries of thingness in property law. One difficulty in describing the boundaries of a thing is that things are often divisible into their constituent parts — smaller chunks of the world, smaller things. A car might be said to be a thing, but it is made up of many other things, including wheels, glass, and a mechanical drive system. Those things themselves are divisible, down to the level of elementary particles.

2.29 This illustrates a simple but important point: the exercise of judgement as to what a legal thing/object of property is, and when a legal thing/object of property arises, is a matter of law, not fact. Professor Smith describes this legal exercise of judgement as follows:[80]

> Property organizes this world into lumpy packages of legal relations – legal things – by setting boundaries around useful attributes that tend to be strong complements.

2.30 For example, our law is flexible enough to recognise that a car is a thing that can be the legal object of property rights, even though it is made up of many other smaller things. Equally, if a thief steals the wheels from a car, the law recognises that the thief has not stolen the whole car. The law is flexible enough to recognise that the wheels themselves are things/objects of property that can be stolen, even though they are made up of rubber, bolts, and metal.

2.31 The legal exercise of judgement as to thingness generally bundles together practical, factual, and social features to determine sensible boundaries for any particular thing (such as around a car, or its wheels). We think that the ability of the law of England and Wales to conceptualise thingness in a flexible way is an important and constructive feature.

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77 Jeremy Bentham made this point long ago when he pointed out that "in common speech in the phrase "the object of a man's property", the words 'the object of' are commonly left out." See J Bentham, *An Introduction to the Principles of Morals and Legislation* (1789) Ch 16 s 2 para XXVI n 35. Similarly, Professor Birks suggests that suitable objects of property are "the [thing] to which [a property right] relates": P Birks, *An introduction to the law of restitution* (1985) p 49 (Professor Birks uses the term "res" instead of the term "thing"). This concept is sometimes referred to as "exigibility", see: J Sarra, L Gullifer, "Crypto-claimants and bitcoin bankruptcy: Challenges for recognition and realization" (2019) 28(2) *International Insolvency Review* 233, 243. See also P Birks, *An introduction to the law of restitution* (1985) pp 49 to 50. See also M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) paras 1-004 to 1-006.

78 J G Allen, "Property in Digital Coins" (2019) 8(1) *European Property Law Journal* 64, 65.

79 H E Smith, "The thing about exclusion" (2014) 3 *Property Rights Conference Journal* 95, 119.

80 H E Smith, "Property as the Law of Things" (2012) 125(7) *Harvard Law Review* 1691, 1693.

2.32 It is important because the concept of a legal thing grounds property rights by reference to that thing.[81] First, this means that property rights can be simple enough and impersonal enough to be understood by, and enforced against, the world. In general, people can identify things in which they do not have property rights and can then assume that they should not interfere with those things.[82] Second, by separating out and depersonalising a chunk of the world, thingness makes it much easier to determine how others can be excluded from the use of, or interference with, that thing. Third, defining property rights by reference to a thing also means that those property rights, in general, should be more easily transferable from one party to another.

2.33 In other words, the determination of thingness creates *legal* boundaries which "carve up the world into semiautonomous components — modules."[83] Those modules — those distinct functional things — then allow private law to manage complex interactions among private parties.

2.34 So, in summary, property law draws "boundaries around complementary clusters of attributes".[84] Property law identifies certain desirable and interconnected features and describes the nexus of their connection as a "thing". This nexus does not have to be a physical object; it merely has to be a point at which any relevant features converge. For example, Professor Gray argues that "a three-dimensional quantum of airspace can exist as an 'independent unit of real property'".[85]

2.35 In this way, the law of England and Wales retains some flexibility in determining what a legal thing/object of property is. A key question is, therefore: "What features or attributes must a thing have before it can be the legal object of property rights?". We describe some answers to this question in detail below to help us consider the way in which digital assets exhibit the characteristics of other objects of property rights.[86]

CHARACTERISTICS OF LEGAL THINGS/OBJECTS OF PROPERTY RIGHTS

2.36 Property law uses guiding principles to help determine when a thing can be the object of property rights. Below, we consider commonly used criteria for "thingness", including:

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81 The idea that a property right must be grounded in a thing is commonly referred to as the requirement of "exigibility", see M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-007.

82 H E Smith, "The thing about exclusion" (2014) 3 *Property Rights Conference Journal* 113.

83 H E Smith, "Property as the Law of Things" (2012) 125(7) *Harvard Law Review* 1691, 1703.

84 H E Smith, "Property as the Law of Things" (2012) 125(7) *Harvard Law Review* 1691, 1726. See also M Crawford *An Expressive Theory of Possession* (2020) p 16: "At a deeper level … even simple objects of property, from chairs to parcels of land, can be understood, not as monolithic entities, but as collections of attributes that are bundled together in combinations that enable or promote valuable uses".

85 K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal* 259.

86 We think that the flexibility of the law's approach to thingness is particularly important in the context of digital assets. As we discuss in Chapters 4 and 5, we think that the law can examine the factual, technological, and social features of digital assets and usefully recognise certain digital assets as things or objects as being capable of attracting property rights.

(1) the characteristics described by Lord Wilberforce in *National Provincial Bank v Ainsworth* ("the *Ainsworth* criteria");

(2) excludability;

(3) that the thing must be rivalrous;[87]

(4) separability; and

(5) value.

The *Ainsworth* criteria

2.37 When considering whether a thing can attract property rights, courts often start with Lord Wilberforce's list of the characteristics of property set out in his judgment in *National Provincial Bank v Ainsworth ("Ainsworth")*:[88]

> Before a right or an interest can be admitted into the category of property, or of a right affecting property, it must be definable, identifiable by third parties, capable in its nature of assumption by third parties, and have some degree of permanence or stability.

2.38 Lord Wilberforce suggested these four characteristics in the context of distinguishing a personal right against an individual from a property interest in a thing (such as some real estate).[89]

2.39 Subsequent case law has taken the *Ainsworth* criteria and applied them to a variety of different things to determine whether those things are capable of attracting property rights.[90] However, the *Ainsworth* criteria operate as a "negative threshold" test for things that attract property rights.[91] If a thing does not satisfy the criteria, it will not attract property rights. But it does not necessarily follow that the thing will attract property rights just because it does satisfy the criteria. The *Ainsworth* criteria are,

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87 A thing is rivalrous if use or consumption of the thing by one person, or a specific group of persons, inhibits use or consumption of the thing by one or more other persons. We discuss the concept of rivalrousness in greater detail at paragraph 2.62 below, and in Chapter 5.

88 *National Provincial Bank v Ainsworth* [1965] AC 1175 at 1247 to 1248.

89 *National Provincial Bank v Ainsworth* [1965] AC 1175 at 1248. Lord Wilberforce held that a "deserted wife's equity" – the historical right of a wife to prevent her husband from using his legal ownership to evict her from the family home – was not a property right exercisable against a third party lender in a mortgage. After listing the four characteristics of property, he concluded that "the wife's right has none of these qualities, it is characterised by the reverse of them"

90 See *Gray v Global Energy Horizons Corp* [2020] EWCA Civ 1668 at [460] to [461]; *AA v Persons Unknown* [2019] EWHC 3556 (Comm), [2020] 4 WLR 35; *Ruscoe v Cryptopia Ltd (in liq)* [2020] NZHC 728, (2020) 22 ITELR 925; *Quoine Pte Ltd v B2C2 Ltd* [2019] SGHC(I) 3, [2019] 4 SLR 17; *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10, [2013] Ch 156; *Kennon v Spry* [2008] HCA 56, (2008) 238 CLR 366 at [162]; *R v Toohey; Ex parte Meneling Station Pty Ltd* [1982] HCA 69, (1982) 158 CLR 327 at 342; and *Australian Capital Television Pty Ltd v The Commonwealth* [1992] HCA 45, (1992) 177 CLR 106 at 165.

91 T Cutts, "Crypto-Property? Response to Public Consultation by the UK Jurisdiction Taskforce of the LawTech Delivery Panel" (June 2019) *LSE Policy Briefing 36* p 4.

therefore, not a definitive description of all the characteristics a thing must have before it can attract property rights.[92]

2.40 In addition, from existing case law, it is difficult to distil a precise definition of the *Ainsworth* criteria. While subsequent courts have applied the criteria, their judgments have offered little further analysis of what the criteria are or how they are satisfied. In some cases, references by subsequent courts to these characteristics treat them as self-defining and self-explanatory.[93] For example, Steven Morris QC[94] applied the principles in *Armstrong v Winnington*, without defining them further:[95]

> In my judgment, an EUA [carbon credit] is "property" at common law. It is definable, as being the sum total of rights and entitlements conferred on the holder pursuant to the ETS [the EU Emissions Trading System]. It is identifiable by third parties; it has a unique reference number. It is capable of assumption by third parties, as under the ETS, an EUA is transferable. It has permanence and stability, since it continues to exist in a registry account until it is transferred out either for submission or sale and is capable of subsisting from year to year.

2.41 Respondents to our call for evidence, including Linklaters and the British and Irish Law, Education and Technology Association ("BILETA"), recognised the importance of the *Ainsworth* criteria to the question of whether a thing can be the object of property rights. The UKJT Statement works through the application of the *Ainsworth* criteria to crypto-tokens in detail.[96] In *AA v Persons Unknown*, Mr Justice Bryan referred explicitly to the UKJT Statement and applied the *Ainsworth* criteria to crypto-tokens such as bitcoins,[97] holding that they were capable of attracting property rights.[98] We recognise the importance of the *Ainsworth* criteria to the law of England and Wales, but do not repeat the reasoning of the UKJT Statement (with which we agree) in this consultation paper. Instead, we consider how the *Ainsworth* criteria have been developed in subsequent case law.

2.42 However, we also recognise the limits of the *Ainsworth* criteria in the context of digital assets. As mentioned, the *Ainsworth* criteria operate as a necessary, but not

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92 See the discussion of different characteristics (or "incidents") of property rights in M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) paras 1-004 to 1-008. See also the UKJT Statement para 39: "Judges tend to approach the issue on a case-by-case basis, considering whether particular things are property for particular purposes."

93 Some cases cite and apply the *Ainsworth* criteria without providing any analysis of the individual factors: see for example *AA v Persons Unknown* [2019] EWHC 3556 (Comm), [2020] 4 WLR 35 at [59]; *Gray v Global Energy Horizons Corp* [2020] EWCA Civ 1668 at [460] to [461]; *Korea v Dayyani* [2019] EWHC 3580 (Comm), [2020] Bus LR 884 at [41]; *Re Mineral Resources Ltd* [1999] BCC 422 at 428.

94 Sitting as a Deputy High Court Judge.

95 This case concerned whether EU carbon emission allowances ("EUAs") could be property. *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10, [2013] Ch 156 at [50]. See also *Tucows.com Co v Lojas Renner SA* [2011] ONCA 548, 106 OR (3d) 561 at [65].

96 UKJT Statement paras 49 to 58.

97 We appreciate that bitcoin, as a notional unit of account within the Bitcoin system is often described as a "coin" and not a "token". We discuss this in more detail in Chapter 10.

98 [2019] EWHC 3556 (Comm), at [58] to [59]. The *Ainsworth* criteria were also explicitly applied by the New Zealand High Court in the context of crypto-tokens including bitcoin in *Ruscoe v Cryptopia Ltd (in liq)* [2020] NZHC 728, (2020) 22 ITELR 925 at [102] to [119].

sufficient, condition for determining the existence of a property right.[99] This means that the *Ainsworth* criteria are less useful in determining difficult "grey area" or boundary cases, when applied to the many different digital assets that exist today. Nevertheless, they are a helpful starting point.

"definable"

2.43 At the simplest level, courts have treated this criterion as satisfied by stating what the thing in question is.[100] For example, in *Armstrong v Winnington*:[101]

> [An EU carbon allowance ("EUA")] is definable, as being the sum total of rights and entitlements conferred on the holder pursuant to the [Emissions Trading System].

2.44 In the Canadian case of *Tucows.com Co v Lojas Renner SA ("Tucows"),* Justice Weiler undertook a similar exercise:[102]

> A domain name is an intangible or ideational thing consisting of two parts, one being numerical and the other being a distinctive readable address that enables an Internet user to access a web page.

2.45 There is also some judicial and academic support for an interpretation of "definability" as requiring an item to be distinguishable from other similar items. This might be assessed on parameters similar, or identical, to the test for certainty of subject-matter used in the context of trusts.[103] As Professor Fox explains:[104]

> The specificity of a resource is essential to its characterization as an object of property. Property must relate to some identifiable and discrete resource. It cannot confer a floating entitlement to all resources of the same generic type.

2.46 We note that this question is not necessarily straightforward in respect of "fungible" things that are also said to be intangible. We discuss this difficulty in more detail, specifically in relation to crypto-tokens, in Chapter 15.

"identifiable by third parties"

2.47 The criterion of definability is similar to the criterion that a thing must be identifiable by third parties, but they are separate *Ainsworth* criteria.

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99 J D Michels, C Millard, "The New Things: Property Rights in Digital Files" [2022] *The Cambridge Law Journal* 1.

100 UKJT Statement para 49. See also *Ruscoe v Cryptopia Ltd (in liq)* [2020] NZHC 728, (2020) 22 ITELR 925 at [104] to [105]: Gendall J concluded that "definability" was equivalent to subject matter being identifiable, in that it is capable of being separated and distinguished from other similar items. He concluded, for example, that the public key of a crypto-token rendered it definable.

101 *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10, [2013] Ch 156 at [50].

102 *Tucows.com Co v Lojas Renner SA* [2011] ONCA 548, 106 OR (3d) 561 at [65].

103 B McFarlane, C Mitchell, *Hayton and Mitchell on the Law of Trusts & Equitable Remedies* (14th ed 2015) para 4-070: "The need to identify the specific property to which [a person's] right relates is certainly not unique to trusts: it is present in any case where [a person] claims a legal or equitable property right."

104 D Fox, "Cryptocurrencies in the Common Law of Property", in S Green, D Fox, *Cryptocurrencies in Public and Private* Law (2019) para 6.21.

2.48 "Identifiability" requires that third parties are factually able to establish the existence of a thing, whereas "definability" is usually related to the identity of the thing that is itself in question.

2.49 For example, in *Armstrong v Winnington,* EUAs were held to be identifiable by third parties on the basis of their unique reference number.[105] In *Tucows,* which concerned a domain name, the fact that the appellant seeking the transfer of the domain name had successfully identified the respondent's rights over it indicated that it was identifiable by third parties.[106]

2.50 However, the test is not neatly applicable to intangible things such as a personal (legal or equitable) right against another of which there is no physical indication, such as the "deserted wife's equity" in *Ainsworth.* In that case, Lord Wilberforce held that the deserted wife's equity was not identifiable by third parties. Notwithstanding this difficulty, the law now recognises that contractual rights are capable of being the object of property rights.[107] Bare contractual claims are capable of being the object of property rights,[108] as are debts which are "perhaps the oldest and arguably the most important example of things in action".[109] Many contractual rights are unlikely to be readily identifiable by third parties. Because of this, the criterion of "identifiable by third parties" might be better understood as a criterion for whether any information exists which describes the relationship between the person and the thing that is the object of property rights.[110] If that information exists (even if the information is not readily available to third parties), then the criterion is likely to be satisfied.

2.51 For intangible things, definability and identifiability might be satisfied by the same feature. For example, the distinctive readable address that defines a domain name also allows it to be discovered or identified by third parties by virtue of the specific function of the domain name within the internet protocol.[111] In general, however,

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105 In *Ruscoe,* Gendall J held that the identifiability requirement referred to a thing having an identifiable owner; that is, an owner who could exclude others from enjoyment of the thing. He concluded that this was satisfied by the private key which gave factual control over the crypto-token in question. However, on the interpretation above, it is hard to see why identifiability should not instead be satisfied by the unique public key address associated with the relevant crypto-token in a situation analogous to the carbon credits in *Armstrong v Winnington* (as concluded in the UKJT Statement). Excludability is a relevant quality of property (and is discussed below from 2.70 onwards), but there appears to be limited judicial or academic corroboration of Justice Gendall's equating of it to identifiability. *Ruscoe v Cryptopia Ltd (in liq)* [2020] NZHC 728, (2020) 22 ITELR 925 at [109] to [110].

106 *Tucows.com Co v Lojas Renner SA* [2011] ONCA 548, 106 OR (3d) 561 at [65].

107 See L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para 4-009 for a detailed discussion on this point.

108 "[A] bare contractual claim is also a form of property": Lord Mance in *Belmont Park Investments PTY Ltd v BNY Corporate Trustee Services Ltd* [2011] UKSC 38, [2012] 1 AC 383 at [167].

109 L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para 4-010.

110 In this respect, see J Fairfield, "Bitproperty" (2015) 88 *South California Law Review* 805, 811 in which the author suggests that "property is information: who owns what. Of course, property captures more interests than bare ownership, but the rule generalizes: property can be usefully viewed as that set of information describing who may do what, when, and with which resource."

111 We discuss domain names in more detail in Chapter 8. See also the UKJT Statement, which considered that the unique public key address related to a crypto-token is "sufficient in principle both to define the asset and to identify it to any person with access to the system network": UKJT Statement para 49.

definability refers to the ability to identify in a conceptual sense the thing/asset in question, and to distinguish it from a generic class of things/assets.[112] This is distinct from the requirement that a thing/asset be identifiable to third parties, which requires that a thing/asset is factually discoverable.

"capable in its nature of assumption by third parties"

2.52 This requirement is treated by some commentators and courts as synonymous with transferability or assignability.[113] A thing must be capable of being transferred away from its owner and to a third party to be an object that can attract property rights.[114]

2.53 There is some academic and judicial support for the idea that transferability is the most important of the *Ainsworth* criteria. For example, in *Re Celtic Extraction,*[115] Lord Justice Morritt referred to each of the *Ainsworth* criteria when deciding whether a waste management licence could constitute property. However, when identifying features that were particularly relevant in the context of licences, he emphasised transferability.[116]

2.54 Other judicial and academic sources argue that transferability is not always a necessary characteristic of an object that can attract property rights. For example, in the High Court of Australia, in *R v Toohey*, Justice Mason said:[117]

> Assignability is not in all circumstances an essential characteristic of a right of property. By statute some forms of property are expressed to be inalienable. Nonetheless, it is generally correct to say, as Lord Wilberforce said, that a proprietary right must be "capable in its nature of assumption by third parties".

2.55 This judgment draws out an important distinction between the factual quality or characteristic of transferability — whether a thing is in fact capable of being

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112 We discuss the creation of a trust over intangible assets held in omnibus accounts for multiple users in more detail in Chapter 16.

113 Or "alienabity." *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10, [2013] Ch 156 at [50]; *Re Celtic Extraction* [2001] Ch 475 at 489; L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para 1-080. Arden LJ interpreted this requirement to mean "assignable": *In Re Stanford International Bank* [2010] EWCA Civ 137, [2011] Ch 33 at [132]. In *Tucows.com Co v Lojas Renner SA* [2011] ONCA 548, 106 OR (3d) 561 at [65], Weiler J said that this requirement was satisfied as, on the facts of the case, the appellant was attempting to assume the relevant domain name.

114 An interesting interpretation of this criterion is the judgment of Gendall J in *Ruscoe v Cryptopia Ltd (in liq)* [2020] NZHC 728, (2020) 22 ITELR 925 at [114], in which Gendall J held that this requirement equated to the desirability of an item to third parties (indicated by the presence of a market for it) and the corresponding availability of legal protection available for such items. This formulation is close to the "realisable value" characteristic suggested by Professor Goode, which we discuss from para 2.81 onwards below.

115 [2001] Ch 475.

116 *Re Celtic Extraction* [2001] Ch 475 at 487 and 489; *Attorney-General of Hong Kong v Nai-Keung* [1987] 1 WLR 1339 at 1342; *de Rothschild v Bell* [2000] 2 QB 33; *Commonwealth of Australia v WMC Resources Ltd* (1998) 194 CLR 1 at 13 to 14. The authors of *The Law of Personal Property* also emphasise the relevance of transferability: L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para 1-005.

117 *R v Toohey; Ex parte Meneling Station Pty Ltd* [1982] HCA 69, (1982) 158 CLR 327 at 342 to 343. This passage was subsequently cited in *Kennon v Spry* [2008] HCA 56, (2008) 238 CLR 366 at [162], though in this case the emphasis was placed on the importance of something being capable in nature of assumption.

transferred — and the legal quality of transferability — whether the law recognises that a thing can be transferred. An example is sperm stored for medical purposes.[118] While the sperm itself is a physical object capable of physical transfer, the legal effect of any such transfer is regulated by the Human Fertilisation and Embryology Act 1990.[119]

2.56 Professor Birks also makes the point that the characteristic of transferability is not, in itself, a definitive quality of a thing that can attract property rights: "the difference [between personal and proprietary rights] has nothing to do with alienability. [Personal rights] can be alienable, and [property rights] can be inalienable."[120]

2.57 Similarly, the authors of *The Law of Personal Property* emphasise the importance of transferability, but do not treat it as determinative:[121]

> Transmissibility is a general incident of property rights in English law. Alienability or transferability is the default position. Inalienability is exceptional.

"some degree of permanence or stability"

2.58 Only a minimal level of permanence or stability is necessary to satisfy this requirement. In *Ruscoe v Cryptopia Ltd (in liq)*, Justice Gendall said:[122]

> [S]ome assets will have little permanence yet can undoubtedly be property, such as the example of the ticket to a football match which can have a very short life yet unquestionably it is regarded as property.[123]

2.59 In *Armstrong v Winnington,* an EUA was considered sufficiently permanent on the basis that it was "capable of subsisting from year to year." In the Canadian case of *Tucows*, rights in relation to a domain name were considered permanent as the domain name had been owned by the same entity for around five years.[124]

2.60 We suggest that while the *Ainsworth* criteria are important, their presence is not a sufficient condition for determining the existence of a property right in relation to a thing. Professor Gray summarises the *Ainsworth* criteria as having a "twin emphasis on the assignability of the benefits inherent in a resource and on the relative permanence of those benefits if unassigned".[125] He argues that, while these are

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118 The leading case of *Yearworth v North Bristol NHS Trust* [2009] EWCA Civ 37, [2010] 1 QB 1 involved the sperm of chemotherapy patients that was (improperly) stored for future use.

119 Which restricts some of an individual's rights over their gametes when separated from the body.

120 P Birks, *An Introduction to the Law of Restitution* (1989) p 49. Professor Birks refers to "rights *in personam*" and "rights *in rem*" respectively.

121 L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para 1-005.

122 *Ruscoe v Cryptopia Ltd (in liq)* [2020] NZHC 728, (2020) 22 ITELR 925 at [117].

123 We suggest however that this is not a perfect example because, while the functionality of the ticket has a short life, the ticket as a physical object has a (potentially) longer life. It is not always the case that a ticket is destroyed after use, but we accept the view that its potentially short life does not preclude it from being an object of property.

124 *Tucows.com Co v Lojas Renner SA* [2011] ONCA 548, 106 OR (3d) 561 at [65].

125 K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal* 251, 292.

relevant, the key feature of a thing that is capable of attracting property rights is not how the thing is *enjoyed* (a transfer would be an example of "enjoyment" of a thing), but how it is *controlled*. As such, the characteristic that he identifies as being determinative of whether a thing that can attract property rights is excludability.[126]

2.61 We discuss excludability as a characteristic of things that can attract property rights at paragraph 2.70 below. Before that, however, we discuss the closely connected concept of rivalrousness.

Rivalrousness

2.62 A number of commentators have identified rivalrousness as an important attribute of things that can attract property rights.[127] Rivalrousness, at its core, "is the idea that if I have a thing, you don't. If I give it to you, you have it, and I don't".[128]

2.63 When a person makes use of, or consumes, a rivalrous resource, that adversely impacts the ability of others to make use of that resource. A simple example is a chair. If Alice is sitting in a chair, Bob cannot sit in it in the same way at the same time. This example is straightforward because only one person can sit in (that is, "use") a chair at a time and therefore the use by Alice of the chair necessarily prejudices the ability of Bob to use the chair.

2.64 On the other hand, when a person makes use of a non-rivalrous resource, that does not affect the ability of others to make use of that resource. The paradigm example of something non-rivalrous is a piece of information. If Alice knows a fact, such as "Tokyo is the capital of Japan", there is no conceptual barrier to Bob knowing the same fact at the same time. Indeed, there is no conceptual barrier to anyone else knowing the same fact. Information has no inherent limit on its capacity to be used by different people at the same time.

2.65 A more formal definition of the concept is that something is rivalrous "if use or consumption by one person, or a specific group of persons, inhibits use or consumption by one or more other persons".[129]

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126 "If our own travels in search of "property" have indicated one thing, it is that the criterion of "excludability" gets us much closer to the core of "property" than does the conventional legal emphasis on the assignability or enforceability of benefits": K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal* 251, 294.

127 See, for example, J Fairfield, "Bitproperty" (2015) 88 *Southern California Law Review* 805; T Cutts, "Crypto-Property? Response to Public Consultation by the UK Jurisdiction Taskforce of the LawTech Delivery Panel" (2019) *LSE Law Policy Briefing Paper no.36*; T Cutts, "Possessable Digital Assets: Response to the Electronic Trade Documents Law Commission Consultation Paper No 254 and Call for Evidence on Digital Assets 2021" (2021) *LSE Law Policy Briefing Paper no.47*; and J D Michels, C Millard, "The New Things: Property Rights in Digital Files" [2022] *The Cambridge Law Journal* 1. Professors Fox and Gullifer, in their response to the Law Commission's Call for evidence on digital assets, have also jointly endorsed the concept of rivalrousness as a criterion for identifying objects that are suitable for property rights.

128 J Fairfield, "Tokenized: The Law of Non-Fungible Tokens and Unique Digital Property" (2022) 97 *Indiana Law Journal* 1261, 1266. We discuss the meaning of rivalrousness in detail from para 2.62.

129 T Cutts, "Possessable Digital Assets: Response to the Electronic Trade Documents Law Commission Consultation Paper No 254 and Call for Evidence on Digital Assets 2021" (2021) *LSE Law Policy Briefing Paper no.47* p 1.

2.66 Rivalrousness matters in real life because things that people want to use are generally scarce:[130]

> The vast majority of the uses that a person will make of a thing are impossible if everyone tries to use the thing at the same time. Because we live in a world of scarcity there is an insufficient quantity of perfect substitutes for everything that people wish to use, and this cannot but give rise to conflict.

2.67 We think that the characteristic of rivalrousness is necessary for any digital asset to attract property rights. Rivalrousness is not incidental in the context of digital assets — instead, it is a design feature which is difficult to achieve. We consider how the characteristic of rivalrousness might arise by design in the context of data objects that exist within socio-technical systems such as crypto-token systems in further detail in Chapter 10.

2.68 We suggest, therefore, that the rivalrous nature of certain things plays an important role in their suitability as objects of property rights. This is for two reasons. First, because a rivalrous thing's capacity for use is not unlimited; people must compete with one another for it. The law of property mitigates the risk of conflict by authoritatively allocating objects to people.[131] Second, because if something is rivalrous then it is possible for a person to control access to it, at least through the act of using it. The act of using a rivalrous thing necessarily excludes others from it.[132] One of the primary social and economic functions of property law is protecting a person's ability to use a rivalrous thing by conferring on them property rights that reinforce their ability to control access to it.

2.69 However, just because it is *possible* for a person to control access to a thing, this does not mean that the law will always support such control through property rights that relate to that thing. Instead, the law will not recognise and protect, through legal property rights, a person's ability to use a rivalrous thing if it is either unfeasible or inappropriate for access to that thing to be controlled. How the law achieves this is, in part, by application of the concept of excludability, to which we now turn.

Excludability

2.70 The factual ability either to exclude or to permit access to a thing is fundamental to the concept of property. As Professor Gray suggests, property has more to do with control over access to a thing than with enjoyment of the thing.[133]

2.71 What follows from this proposition is that, if a thing is to attract property rights, it must be the type of thing to which a person can either exclude or permit access.[134] In other words, the thing must be "excludable", and this is the case "only if it is feasible for a

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130 J E Penner, *The Idea of Property in Law* (1997) p 69.

131 T Cutts, "Crypto-Property? Response to Public Consultation by the UK Jurisdiction Taskforce of the LawTech Delivery Panel" (2019) *LSE Law Policy Briefing Paper no.36* p 2.

132 Or, at least, prejudices the ability of others to make equivalent use of the thing at the same time.

133 K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal* 251, 294, discussed in more detail at paragraph 2.60 above.

134 M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-006.

person to exercise … control over the access of strangers to the various benefits inherent in the resource".[135] If this is the case, we can say that a thing meets the threshold for excludability; it is sufficiently excludable to attract property rights. However, the threshold for excludability is not always determined by reference only to the factual characteristics of a thing. It also involves the exercise of legal and social judgement. A thing may fail to meet this threshold in one (or more) of three ways.[136]

(1) It may be physically impractical to control access to a thing. For example, an open-air spectacle like a horse race may be viewable from nearby hills or houses.[137] The beam of light from a lighthouse is also not physically excludable in any significant or practical way. In general, such things are not considered to be excludable, even though it would technically be possible to exclude others from their use.

(2) A person may fail to use the available law to control access to a thing.[138] As we will go on to consider, rights created by legally recognised mechanisms such as contracts are given some property protection.[139] This is because the parties have used the available law to create some level of legal excludability around their rights.

(3) It may be morally inappropriate to control access to a thing. If the law endorses a thing as capable of attracting property rights, that thing is then capable of being removed from general public enjoyment in favour of private ownership. When it is morally acceptable to do this will depend on societal perspectives and goals at the time. One example of the primacy of social objectives over property law is found in the caselaw about treating severed body parts as objects of property rights.[140]

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135 K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal* 251, 256. Note that Professor Gray uses the term "regulatory control". We removed the word "regulatory" in this quotation because of its connotations related to prescriptive law.

136 K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal* 251, 269 and 280.

137 *Victoria Park Racing and Recreation Grounds Co Ltd v Taylor* (1937) 58 CLR 479.

138 "The plaintiff who neglects to utilise relevant legal protection has failed, so to speak, to raise around the disputed resource the legal fences which were plainly available to him. He has failed to stake out his claim; he has failed in effect to propertise the resource.": K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal* 251, 269 to 274.

139 See Chapter 4 from para 4.26.

140 See eg Lord Judge, Lord Chief Justice of England and Wales in *Yearworth v North Bristol NHS Trust* [2009] EWCA Civ 37, [2010] QB 1 at [30]: "*Dominus membrorum suorum nemo videtur* (no one is to be regarded as the owner of his own limbs)… The common law has always adopted the same principle: a living human body is incapable of being owned. An allied principle is that a person does not even "possess" his body or any part of it", referring to *R v Bentham* [2005] UKHL 18, [2005] 1 WLR 1057; Gage J in *A B and others v Leeds Teaching Hospital NHS Trust (Re Organ Retention Group Litigation)* [2004] EWHC 644 (QB), [2004] 2 FLR 365 at [135]: "In my opinion the most appropriate place to start the analysis of the law is from the firm ground of a proposition which is not disputed. This is the principle that there is no property in the body of a deceased person." The policy grounds which underpin this position are the moral objections against commodifying the human body: for an elaboration of this point, see Justice Arabian's judgment in *Moore v Regents of the University of California* 51 Cal. 3d 120, 793 P.2d 479 (Supreme Court of California).

2.72 We think that it is important to recognise the law's nuanced approach to the concept of excludability when applying that concept to digital assets. While many digital assets are functionally excludable by design, the way in which that excludability is achieved might be different between different systems. We discuss the characteristics of excludability, and the closely connected concept of rivalrousness, in greater detail in Chapter 5.[141]

2.73 Although these characteristics both provide useful indications that a thing will attract property rights, they do not provide the whole story. For example, a living person's (unsevered) hand is, as a matter of fact, both rivalrous and excludable. Yet no one can have property in it. To attract property rights, things also need to demonstrate separability. As mentioned at paragraph 2.71(3) above, there are also important policy consideration weighing against the recognition of body parts as objects of property.

Separability

2.74 In general, the law requires that, for a thing to be capable of attracting property rights, that thing must be "subject matter independent of the person".[142] Professor Penner describes this concept of "separability" as:[143]

> Only those 'things' in the world which are contingently associated with any particular owner may be objects of property …
>
> What distinguishes a property right is not just that they are only contingently ours, *but that they might just as well be someone else's*. (emphasis in original)

In some situations, the courts have found that body parts can be the objects of property rights. Body parts which had been the subject of skilled dissection and prosecution, thus having a "use or significance beyond their mere existence", were objects of property for the purposes of s 4 Theft Act 1968 (Rose LJ in *R v Kelly* [1998] 3 All ER 741 at 750). This is explained, in part, by scientific advancements, which led to parts of the human body individually becoming subjects of medical or scientific processes involving the application of skill and labour. In the words of Griffiths CJ in *Doodeward v Spence* (1908) 6 CLR 406 (High Court of Australia) at 414: "when a person has by the lawful exercise of work or skill so dealt with a human body or part of a human body in his lawful possession that it has acquired some attributes differentiating it from a mere corpse awaiting burial, he acquires a right to retain possession of it." In *Yearworth v North Bristol NHS Trust* [2009] EWCA Civ 37, [2010] QB 1 at [45], the Court of Appeal said that "developments in medical science now require a re-analysis of the common law's treatment of and approach to the issue of ownership of parts or products of a living human body". The Human Tissue Act 2004 creates a framework for the removal, storage and use of human tissue, but intentionally was designed, in part, to avoid creating any property rights in such human tissue by using a system of consents instead. See L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para 3-018 onwards.

In the cases where the courts have recognised that body parts can attract property rights, this is in general because the moral arguments for doing so outweighed the moral arguments against doing so. Therefore, whether body parts, albeit rivalrous objects, can be treated by the law as sufficiently excludable so as to attract property rights will, in part, involve the exercise of moral and policy considerations. One particularly important situation in which moral arguments weigh in favour of property rights attaching to human body parts is where work or skill is applied to them for medical or scientific purposes. The existence of property rights in such a situation is justified both by the furthering of human progress through science, and by the fact that the application of work to the body parts substantially transforms their character.

141 See para 5.48 onwards.

142 J Edelman, "Property Rights to Our Bodies and Their Products" [2015] 39(2) *University of Western Australia Law Review* 47, at 53.

143 J E Penner, *The Idea of Property in Law* (1997) p 111.

2.75 Professor Penner uses this idea first to explain why things such as our talents, personalities or friendships cannot be the object of property rights: none of those things is separable from us in any straightforward way. Second, he uses the concept of separability to explain that what distinguishes a property right is not just that it is "a person's right" in relation to a thing but that "the right might just as well be someone else's".[144] In other words, there is and can be nothing special about any given property right in relation to a thing.[145] For example, following a transfer, the relationship the next owner will have to a thing will be identical to the relationship the transferor had with the thing.[146]

2.76 The common law of England and Wales came to the same conclusion when considering the legal status of an unsevered hand. In *R v Bentham*,[147] the House of Lords considered whether a man holding his hand within his jacket, to appear as if he were holding a gun, could be charged with being in possession of an imitation firearm.[148]

2.77 The House of Lords concluded that an "unsevered hand" was not a separable legal object/thing that was capable of being possessed. In the leading judgment, Lord Bingham said that "one cannot possess something which is not separate and distinct from oneself…[w]hat is possessed must under definition be a thing. A person's hand or fingers are not a thing."[149]

2.78 Another way of phrasing the "separability" criterion is that a thing that is capable of attracting property rights must have an independent existence. A hand (or fingers) is not a thing that is capable of attracting property rights because it has no existence independent of the person to whom it is attached.[150] A severed hand or a severed finger does, however, have an independent existence because it has become an object distinct from any person who might happen to hold it.[151]

Value?

2.79 There is a significant difference of opinion in case law and academic commentary on the relevance of "value", or a market for a thing, to whether that thing can attract

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144 J E Penner, *The Idea of Property in Law* (1997) p 112.

145 J E Penner, *The Idea of Property in Law* (1997) p 112.

146 We discuss the concept of transferability (divestibility) in more detail in Chapter 5. We consider, however, that separability is distinct from transferability — there might be examples of a thing that exhibits the characteristic of separability even though it is not possible (or practicable) to transfer that thing.

147 [2005] UKHL 18, [2005] 1 WLR 1057.

148 Broadly speaking, s 17(2) Firearms Act 1968 provides that a person shall be guilty of an offence if at the time of committing or being arrested for another offence they are in possession of "a firearm or imitation firearm". In turn, s 57(4) defines an "imitation firearm" as meaning "any *thing* which has the appearance of being a firearm … whether or not it is capable of discharging any shot, bullet or other missile" (emphasis added).

149 *R v Bentham* [2005] UKHL 18, [2005] 1 WLR 1057 at [8].

150 J E Penner, *The Idea of Property in Law* (1997) p 112.

151 Nevertheless, although a human body part exhibits similar qualities to other tangible things (such as excludability, rivalrousness, and separability), the common law does not generally recognise property rights in human bodies or body parts (though this area is now largely regulated by statute). For an in-depth discussion, see n 140 above.

property rights. Some cases point to value as a relevant or even key indicator of property rights,[152] while others argue that it is irrelevant. For example, the authors of *The Law of Personal Property* suggest that "whilst … economic value [is] often present in the modern cases, these are not true indicia of property rights."[153]

2.80 We suggest that value is likely to continue to play a significant role in identifying things that can be the object of property rights. This is for the simple social and economic reasons that persons are more likely to seek (or dispute) the legal recognition and protection of valuable things as opposed to valueless things. However, our view is that a thing need not have any intrinsic or commercial value for that thing to be capable of attracting property rights.[154] Moreover, value (at least when used in its colloquial sense) is not on its own a principled reason for a thing to attract property rights:

(1) A thing that attracts property rights might not be valuable — it could in fact have negative value. Sometimes, the cost of any liabilities relating to a thing may outweigh the value of any accompanying rights. For example, a written-off car may incur scrappage costs that exceed the scrappage value. This does not mean that property rights in relation to the written-off car no longer exist.

(2) Value is subjective and may fluctuate. A tangible thing can attract property rights regardless of fluctuations in value. Shares in companies regularly fluctuate in value and may eventually become worthless, yet the fluctuations in value do not affect the property rights in relation to the shares. Similarly, value is relative. It is possible to imagine, for example, a highly specialised item that is of great value to the individual who possesses it and yet is largely worthless to third parties.[155]

(3) Information in itself may have value, but is generally not considered an appropriate object of property rights. We discuss this in greater detail in Chapter 3.

2.81 It is worth distinguishing value as described above from what Professor Goode describes as "realisable value", which is a more nuanced concept. Realisable value as a characteristic of a thing that can attract property rights "is intended to signify that the item in question must have property-like qualities, that is, be of a kind which is transferable in the broad sense … and for which a person would pay a price if value

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[152] See eg *Re Celtic Extraction* [2001] Ch 475 at 489; *Attorney General of Hong Kong v Nai-Keung* [1987] 1 WLR 1339 at 1342; *Ruscoe v Cryptopia Ltd (in liq)* [2020] NZHC 728, (2020) 22 ITELR 925 at [114]; *Hanger Holdings v Perlake Corporation SA, Simon Croft* [2021] EWHC 81 (Ch) at [74].

[153] L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para 1-080.

[154] For example, samples of gametes stored on behalf of chemotherapy patients have little marketable value in the United Kingdom (partly because of statutory restrictions on sale) yet are capable of attracting property rights: *Yearworth v North Bristol NHS Trust* [2009] EWCA Civ 37, [2010] 1 QB 1. Contrast this with the position in other jurisdictions where there is a market for human gametes which places significant value on them. Because value is, in many ways, a subjective concept, we do not treat it as a necessary characteristic of things that can attract property rights. However, property law recognises and protects rights in objects regardless of the fact that they might have little or no realisable value, such as a child's painting. In this way, property rights do not distinguish between objective and subjective value (although remedies are, of course, based on concepts of objective value for fairness reasons).

[155] An example might be bespoke fittings for an ambitious architectural project.

were to be had."[156] This concept distinguishes "things" such as licences personal to the holder that are incapable of transfer, which are not capable of attracting property rights, from things like leases at a rent which exceeds market value, which are.[157]

2.82 Professor Goode's reference to realisable value is clear in the context of insolvency. In that context, the principal question is whether a thing can have any realisable value to the company in liquidation (such that any proceeds can be used to maximise the extent of the insolvent estate available for distribution). This is distinct from a thing which is valuable only to the company itself. In that sense, we agree that the concept of realisable value, which incorporates the concepts of transferability and separability, is a useful indicator of a thing that can attract property rights.[158]

2.83 In the context of digital assets, value has perhaps taken on an even more nuanced and delicate meaning, because any "realisable value" arises through a combination of socio-technological elements, including network effects. We discuss this, and the potential consequences for this, in more detail in Chapter 10.

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[156] R Goode, K van Zwieten, *Goode on Principles of Corporate Insolvency Law* (5th ed 2018) para 6-15.

[157] R Goode, K van Zwieten, *Goode on Principles of Corporate Insolvency Law* (5th ed 2018) para 6-15.

[158] See also R Goode, "What is property?" (2022) *Law Quarterly Review*, (forthcoming), in which Professor Goode suggests that "Subject to statute, property is anything of realisable commercial value.".

Chapter 3: Information and property rights

INTRODUCTION

3.1 In the previous chapter we described the constituent elements of the legal concept of property and, more specifically, the characteristics of certain things that attract property rights.

3.2 In this chapter, we discuss information and the reasons why the law of England and Wales does not, in general, treat information as a thing that can attract property rights.[159] We include this detailed consideration of information to ground our consultation paper on the principle that information ought not to attract property rights.

3.3 We do so because this consultation paper goes on to suggest that certain digital assets that are constituted, in part, of data are so distinct from information that the law can treat them as things in themselves. We describe these things as data objects. In Chapters 4 and 5, we suggest that data objects can be the object of property rights.

WHAT IS INFORMATION?

3.4 The term information, much like the term property, lacks a specific legal definition. If anything, information is the more ambiguous of the two terms. There is little detail in case law or academia as to what information actually is. The Oxford English Dictionary defines information as "knowledge communicated concerning some particular fact, subject, or event; that of which one is apprised or told; intelligence, news."[160]

3.5 Information is closely associated with related terms like data and knowledge, which try to capture that intangible thing that is conveyed by (but not reducible to) some particular arrangement of other things or information (like objects or words or computer bits).

3.6 In discussions of information as the object of property rights, courts and commentators sometimes use the term pure information.[161] The adjective pure is often used in this sense as a linguistic means to conceptually separate the intangible, abstract thing that is information from the means by, or on which, that information is recorded. For example, references to pure information seem to be made to emphasise a distinction between that information and:

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159 In our 1988 Working Paper 110 on Computer Misuse, we stated that "Information is not property in English law (although in certain respects it has been likened to property)" at [81].

160 "Information", Oxford English Dictionary at https://www.oed.com/viewdictionaryentry/Entry/95568.

161 See eg the New Zealand Supreme Court in *R v Dixon* [2015] NZSC 147 at [23] by Arnold J; UKJT, Legal Statement on cryptoassets and smart contracts (November 2019) ("UKJT statement") at [65], https://technation.io/lawtechukpanel/; and K Low, E Teo, "Bitcoins and Other Cryptocurrencies as Property" (2017) 9(2) *Law Innovation and Technology* 235, 247.

(1) the tangible medium in which that information is contained, whether a human brain, a piece of paper,[162] a USB drive[163] or something else;[164] or

(2) something which looks like information but, for a particular reason, is something more than (or different from) information.[165]

3.7 The distinction was considered in detail by Lord Justice Floyd in *Your Response Ltd v Datateam Business Media Ltd.* Discussing the information contained within an electronic database, he explained that:[166]

> An electronic database consists of structured information. Although information may give rise to intellectual property rights, such as database right and copyright, the law has been reluctant to treat information itself as property. When information is created and recorded there are sharp distinctions between the information itself, the physical medium on which the information is recorded and the rights to which the information gives rise. Whilst the physical medium and the rights are treated as property, the information itself has never been.

3.8 The term pure helps to ringfence information as something that is not an appropriate object of property rights and to contrast information with things that can attract property rights. We think that maintaining this distinction is particularly important in the context of certain digital assets such as crypto-tokens: these are constituted of information that is uniquely instantiated within a system that itself has a tangible, albeit highly distributed, existence.[167] This combination of pure information, technical frameworks, and social networks of human actors grants some digital assets characteristics or attributes that make them function much more like objects than mere

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162 *Oxford v Moss* (1979) 68 Cr App R, which we discuss in more detail at para 3.65.

163 See *R v Dixon* [2015] NZSC 147, by French J in the New Zealand Court of Appeal at [31]: "A computer file is essentially just a stored sequence of bytes that is available to a computer program or operating system. Those bytes cannot meaningfully be distinguished from pure information." We note however that this decision was reversed by the New Zealand Supreme Court which held that the digital files in question were "property and not simply information" *R v Dixon* [2015] NZSC 147 at [23] by Arnold J. The reasoning in the Supreme Court decision is criticised by the authors of The Law of Personal Property at paras 8-016 to 8-018: L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021).

164 A distinction drawn in the UKJT Statement at [59] and by Floyd LJ in *Your Response Ltd v Datateam Business Media Ltd* [2014] EWCA Civ 281, [2015] QB 41 at [42].

165 For example, in the context of crypto-tokens, the UKJT Statement explains that a crypto-token can be understood as a "conglomeration of public data, private key and system rules" and so is something more than merely information. In contrast, they note that "the private key viewed in isolation … is no more than an item of pure information", at [65]. Similarly, in *Ruscoe v Cryptopia Ltd (in liq)* [2020] NZHC 728, (2020) 22 ITELR 925 at [127] to [128], Gendall J held that "it is wrong … to regard [crypto-tokens] as mere information" … "I am satisfied that [crypto-tokens] are far more than merely digitally recorded information. The argument that [crypto-tokens are] mere information and therefore not property is a simplistic one and, in my view, it is wrong in the present context. I dismiss it.".

166 [2014] EWCA Civ 281, [2015] QB 41 at [42].

167 In Chapter 10 we discuss how, in addition to pure information and mathematics, crypto-tokens rely on a combination of things to create characteristics that make them function like objects. This includes their respective protocol rules, real physical infrastructure, the work of humans and/or machines, energy expenditure, network effects, liquidity, and integration in existing social, economic or financial infrastructure. Nevertheless, as shorthand, in this consultation paper we adopt the language of the courts and academic commentators and refer to digital assets as being "intangible".

records, or information or data. We consider these characteristics in more detail in Chapter 5, and specifically in relation to different digital assets in Chapters 6 to 10.

3.9 Below we discuss the reasons why pure information ought not to attract property rights. We then consider how, even though it is not an appropriate object of property rights, the law of England and Wales does protect pure information in certain circumstances.

INFORMATION IS NOT AN APPROPRIATE OBJECT OF PROPERTY RIGHTS

3.10 Before considering the arguments against information being the object of property rights, we briefly outline the argument in favour.

An argument in favour of information attracting property rights

3.11 The overarching argument in favour of recognising property rights in information is that doing so would provide it with protection against wrongful interference. This might be thought particularly desirable for information that is valuable (economically or otherwise). A classic example of valuable information is confidential information. This can be misappropriated by others, and arguably the law should intervene to remedy any harm or injustice that flows from that misappropriation.[168]

3.12 Recognising a property right in information would give the holder certain rights in that information which were good against all the world. The primary consequence of this is that such persons would be able to rely on property law concepts, including causes of action and associated remedies that depend on a property interest, in the event of any interference with their information.

3.13 However, we already explained that the concept of "value" is not useful in assessing whether a thing should attract property rights.[169] The fact that something is potentially valuable does not mean that the law will automatically treat it as a thing that can attract property rights. An inherently valuable thing may not be a practical subject of property rights (for example, an innovative idea), or may not be recognised as capable of attracting property rights as a matter of policy (for example, body parts).[170] Many valuable things will attract property rights, but only, we suggest, if they also exhibit the characteristics described in Chapter 2.[171]

3.14 Against this argument, however, there are compelling reasons why information is not an appropriate object of property rights.

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168 See A Weinrib, "Information and Property" (1988) 38(2) *The University of Toronto Law Journal* 117, 142 to 143, in which Professor Weinrib argues for the extension of property rights to information. He acknowledges that value is the key impetus behind his argument: "The arguments for protecting confidential information by both civil and criminal sanctions are at their strongest in the case of a valuable trade secret, the product of much effort and expense, which is sought after by competitors."

169 See discussion in previous chapter from para 2.81.

170 For an in-depth discussion, see Chapter 2 n 140 of this paper.

171 See also Chapter 5.

The arguments against information attracting property rights

3.15 There are at least four principal arguments against the recognition of property rights in information:

(1) that information lacks the requisite characteristics to be an object of property rights;

(2) that property law would struggle to apply in any functional sense to information;

(3) the general argument that recognising property rights in information is an undesirable policy choice; and

(4) that information is already the subject of a comprehensive legal regime which is better suited to the characteristics of information than property law is.

Information lacks the requisite characteristics to be an object of property rights

3.16 The first aspect of a property relationship is the presence of a thing to which rights can relate. Property law will only attach rights to things which exhibit certain characteristics such as rivalrousness and excludability, discussed in Chapter 2 and Chapter 5.

3.17 Information does not exhibit those characteristics. To the extent that information is defined at all in case law, it is often by reference to what it lacks from a property law perspective. See, for example, Lord Justice Mummery's comment in *Fairstar Heavy Transport NV v Adkins*:[172]

> A claim to property in intangible information presents obvious definitional difficulties, having regard to the criteria of certainty, exclusivity, control and assignability that normally characterise property rights.

3.18 That case involved the question as to whether a claimant could have a property right in the informational content of their emails.[173] After an extensive review of the authorities, Mr Justice Edwards-Stuart concluded that there was no property right, since the content of emails was no more than information.[174]

3.19 Below, we assess information against the characteristics of objects of property that we outlined in Chapter 2.

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172 [2013] EWCA Civ 886 at [47].

173 *Fairstar Heavy Transport NV v Adkins* [2012] EWHC 2952 (TCC) at [30] to [57]. This decision was reversed on appeal on a separate ground, without full consideration of the property question.

174 *Fairstar Heavy Transport NV v Adkins* [2012] EWHC 2952 (TCC) at [58]. We note that in *Pennwell Publishing v Ornstien* [2007] EWHC 1570, [2007] IRLR 700 at [127] to [128], Mr Justin Fenwick QC (sitting as a Deputy Judge of the Queen's Bench Division) stated that a list of email addresses was a "list of information" but nevertheless "property". However, in *Pennwell*, the proprietary status of the information was not in dispute between the parties and was not the subject of detailed submissions. The issue in the case was to whom the information belonged, not the logically prior question of whether the information could "belong" to anyone at all. For this reason, the precedential value of the case is questionable.

(1) *The Ainsworth criteria (definable, identifiable by third parties, capable in its nature of assumption by third parties, and having some degree of permanence or stability)*

3.20 It is difficult in any real sense to define or identify information as a thing which could be the object of property rights. An idea, for example, can be expressed in many different forms, yet it remains the same idea. It makes little sense therefore, to claim property rights over a specific arrangement of objects, letters, numbers or other informational representations, such as a design.[175] The same difficulties arise in relation to permanence and stability — generally those will be characteristics of the medium in or on which information is recorded and not the information itself. Information is of course capable in its nature of assumption by third parties — an intrinsic feature of information is that it is freely distributable and easy to disseminate.[176] However, information, when passed on, is not thereby taken away from the transferor, so it is not clear that information can be "assumed" by third parties in the same way as a transfer of other things. This is one of the most important distinguishing features of information and is often cited as a principal distinguishing feature by academic commentators and the courts.

3.21 For example, the authors of *The Law of Personal Property* suggest that:[177]

> [Information cannot] be transferred in any sense in which that word is used in the law of property. If A transfers its car to B, then A no longer has rights to its car. Divorced from rights, it is difficult to see how a transfer of information could operate similarly. If A tells B a secret, the result is that both A and B now know the secret, not any transfer in the property sense of the word.

3.22 Nor is it realistically possible to separate information from its original source, particularly where that source is human cognition. As Professor Green[178] and John Randall QC suggest:[179]

> In practical terms, it is not possible to remove [information] from its original source (a human intellect) whether or not it has been transferred (by communication).

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175 As we discuss at para 3.40, this is different to asserting that certain statutorily created rights (such as intellectual property rights) or duties (such as a duty of confidentiality) apply or relate to that information.

176 The nature of information is that it is "easy to spread but hard to stifle": S Nakamoto, "Bitcoin open source implementation of P2P currency" (11 February 2009): http://p2pfoundation.ning.com/forum/topics/bitcoin-open-source.

177 L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) paras 10-031 to 10-032.

178 Professor Sarah Green is the Commissioner for Commercial and Common Law at the Law Commission of England and Wales, and lead Commissioner for this project.

179 S Green and J Randall, *The Tort of Conversion* (2009) p 144. Note also: "the vendor of confidential information inevitably retains that information. It is as if the purchaser receives only a copy. Of course, the vendor may be contractually prohibited from using the information, but that state of affairs is somewhat different from a classic property transaction": K Moon, "The nature of computer programs: tangible? goods? personal property? intellectual property?" (2009) 31(8) European Intellectual Property Review 396, 403. Finally, see the observation of Thomas J that "information, unlike property, cannot be separated from any person who once possessed it," in *Henderson v Walker* [2019] NZHC 2184 at [263].

3.23 The UK Jurisdictional Taskforce, Legal Statement on cryptoassets and smart contracts ("UKJT Statement") expresses this point succinctly as "information cannot be transferred but only transmitted".[180]

(2) *Rivalrousness*

3.24 In many ways, information is the archetypal non-rivalrous resource.[181] Because information can be readily and extensively duplicated, the use of information by one person does not normally prejudice or inhibit the use of that information by another.[182] This makes information a poor candidate as an object of property rights.

(3) *Excludability*

3.25 We think it is possible to exclude others from information, but only in the very limited sense that it is possible not to disseminate information to others. The classic example is a secret — information that you keep from other people. However, this excludability is limited and is not an inherent feature of the information itself. It is therefore not the type of excludability that is normally required for an object of property rights. In fact, it is almost impossible to exclude others from information once it has been transmitted, revealed, or disseminated.[183]

3.26 On this point, the UKJT Statement suggested that:[184]

> One of the principal difficulties in recognising information in general as property is that it is not in its nature exclusive. It can be easily duplicated, with the duplicate indistinguishable from the original and, usually, of equivalent value.

(4) *Separability*

3.27 It is not straightforward, and in many cases not practically possible, to separate information from a person who has had knowledge of it. In this way, information cannot be said to have an existence independent of a particular person.[185] Similarly, as we discuss at paragraph 3.20 above, in many cases a reference to information will not be to pure information but instead to the medium in, or on, which it is recorded. In

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180 UKJT Statement para 62. The authors use a similar example to the one given above: "Unlike property, [information] cannot be alienated: if Alice gives a coin to Bob then she no longer has it; but if she gives information to him then they both know it."

181 "Information … is nonrivalrous, it cannot be assigned in the normal sense with which we associate with property": L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) paras 10-031 to 10-032.

182 "The use of information by A does not prevent B from using the same information": L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para10-031. See also UKJT Statement para 62: "Once disseminated, information can be used simultaneously by different people".

183 There may be highly intrusive ways to "destroy" information, thus re-establishing the exclusivity of those who know that information.

184 UKJT Statement para 62. See also: "In general, information is not property at all. It is normally open to all who have eyes to read and ears to hear": *Boardman v Phipps* [1967] 2 AC 46, 127. Commenting on this statement, see also Gendall J's observation that this statement "appears to confirm as a principle for not regarding information as property the fact that it can be infinitely duplicated": *Ruscoe v Cryptopia Ltd (in Liquidation)* [2020] NZHC 728, [2020] 22 ITELR 925 at [127].

185 S Green, J Randall, *The Tort of Conversion* (2009) p 141.

the context of distinguishing pure information from the medium in or on which it is recorded, Professor Low and Professor Llewelyn suggest that:[186]

> Digital files do not in fact have any physical presence beyond whatever physical mark or change they leave on the medium on which they are stored. No one considers words written in ink on paper to be property separate from the paper itself. Should it matter that the file is stored in code (and thus is ordinarily unintelligible without the aid of a computer programme) on some medium other than paper?

3.28 In this way, it is very difficult to describe pure information as separable from persons other than by reference to the medium in or on which that information is recorded.

Property law would struggle to apply functionally to information

3.29 The characteristics that a thing must have to attract property rights are not arbitrary. They help to identify resources which are most usefully governed by prioritising competing claims over them, and imposing duties on third parties not to interfere with them.

3.30 For example, the requirement that a thing is rivalrous helps to identify resources over which there are likely to be conflicting claims. This is on the basis that the use of such a resource by a person necessarily prejudices the use of that resource by others.[187] Similarly, the requirement of excludability identifies resources over which an individual can practically exercise control.[188] For example, to exclude others from a sunset or an ocean would likely require a disproportionate and nearly impossible level of effort.

3.31 The fact that information fails to demonstrate the characteristics of a thing capable of attracting property rights is a good indication that property law would not be the most effective or useful means of governing it. In this respect, Professor Green[189] and John Randall QC point out that information "does not lend itself well to the mechanisms usually employed to protect things of value [referring to property law]."[190]

3.32 If property rights were recognised in information it could be difficult to determine who, at any given time, had the greatest right to it.[191] Alice might have an excellent idea for a reality television series based on pseudonymous Twitter personalities. If she tells three friends, one of whom notes that their sibling had the very same idea a couple of months ago, who "owns" that information? If the idea itself could be the subject of property rights, it is by no means clear who would enjoy those rights in relation to it — whether that would be Alice, her friends, her friend's sibling, or some combination of

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186 K Low and D Llewelyn, "Digital files as property in the New Zealand Supreme Court: innovation or confusion?" (2016) 132 *Law Quarterly Review* 394, 396. See also K McFadzien, and T Sherman, "Digital Files as Property: A Curious Case in New Zealand" (2016) *Privacy Law Bulletin* 71, 72.

187 See also J E Penner, *The Idea of Property in Law* (1997) p 69.

188 Professor Gray points out that the law will not protect things by property rights if it is not practical to exclude others from them: K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal* 251, 269.

189 Professor Sarah Green is the Commissioner for Commercial and Common Law at the Law Commission of England and Wales, and lead Commissioner for this project.

190 S Green and J Randall, *The Tort of Conversion* (2009) p 141.

191 It is "difficult … to determine, in a meaningful way, who is the owner at any time": UKJT Statement para 62.

the same. It is not clear that property law could usefully or fairly help with this determination.[192]

3.33 There are also practical remedial difficulties in recognising property rights in information. If Alice has property in some information and, in infringement of Alice's right, Bob comes to also know this information, it is not clear how the situation could be remedied. If Alice wanted to stop Bob knowing the information it is unclear how, practically speaking, Bob could make himself forget it, even if so ordered. Further, for as long as that information remains in Bob's head, Bob would continue to interfere with Alice's purported property right.

Recognising property rights in information is an undesirable policy choice

3.34 Whether a thing is capable of attracting property rights is a matter of socially constructed policy decisions, manifested in legal rules. This is because if something is accepted as being an object of property rights, it is removed from the common societal pool of resources. The traditional approach to this exercise of social judgement is that it is morally undesirable for the law to treat information as capable of attracting property rights.

3.35 The free circulation of information — a "marketplace of ideas"[193] — is generally considered to be beneficial to society. The operation of this "marketplace", unlike traditional marketplaces such as the financial markets or the market for goods and services, is not premised on the concept of private property, but rather expressly rejects it. To be able to discuss, and to adopt or reject, ideas, one needs to have access to them. Unfettered access to information is therefore considered a key element of a free society.

3.36 The free circulation of information is closely linked to the concept of free speech. While issues relating to freedom of speech are, in general, outside the scope of this consultation paper, we recognise that the free circulation of information promotes access to education, knowledge, and public discussion.[194] If information, words, or ideas could be the object of private property rights then this could be used to limit other people's access to them in the pursuit of private interests. For example, corporations might be able to obtain property rights over information, thereby restricting its use without payment. Politicians might use property rights to make it costly or impossible for the public to use that information in public discourse.[195]

3.37 The main means by which information is communicated is through words or numbers. Although a piece of information is more than the words or numbers which express it, in practice, the most feasible way to protect a piece of information is often to try and

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192 Of course, that idea could be protected in other ways, for example through intellectual property rights. We discuss this in more detail in Chapter 3.

193 The idea can be traced back to the work of John Stuart Mill, but the phrase itself was first used by Justice Holmes in the United States case *Abrams v United States* 250 US 616 (1919) 630.

194 A Meiklejohn, "The First Amendment is an Absolute" (1961) *Supreme Court Review* 245.

195 The inhabitants of Orwell's Oceania had a limited vocabulary which was intended to restrict their free will and capacity to think outside the permitted scope. G Orwell, *1984* (1950). The free circulation of information however is not necessarily a panacea: in A Huxley's *Brave New World* (1932) the abundance of information available works as a hedonistic distraction.

control the medium of expression. For example, in *Victoria Park Racing v Taylor*,[196] the plaintiff ran an open-air racecourse which the defendant had a view of from his home. The defendant had been watching the races and reporting the results over the radio, resulting in a loss of business to the plaintiff. The plaintiff, to try and prevent this, argued among other things that they had copyright in the results of their races (the numbers of the first three horses). Chief Justice Latham, sitting in the High Court of Australia, said:[197]

> Much more argument than has been produced in this case would be required to convince me that because the plaintiff caused those numbers to be exhibited for a few minutes upon a notice board, everybody in Australia was thereafter for a term of fifty years from somebody's racing and death precluded from reproducing them in any material form.

3.38 Professor Gray cites this case to illustrate that information is too important politically and socially to be susceptible to property rights.[198] Similarly, Professor Fox says that "the free flow of ideas is usually in the public interest. It would need some special reason to restrict the use of information by making one person the owner of it."[199]

3.39 It is easy to imagine how the recognition of property rights in information could quickly devolve into a world of claims over words and numbers. Recognising property rights in information would potentially stifle freedom of speech, expression, and creativity.[200] As such, any decision to do so would be against public policy interests.

Information is already the subject of a comprehensive legal regime

3.40 Finally, information is already the subject of a variety of different legal rules. These rules are a more appropriate way to protect information. Because of the complexity and extensive reach of this legal regime, the recognition of property rights in information could cut across or undermine the existing and well-recognised means of protecting information.[201]

3.41 Socially and economically, information serves a different function to existing objects of property rights. In many cases, an object of property rights functions as a store of

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196 [1937] HCA 45, (1937) 58 CLR 479.

197 *Victoria Park Racing and Recreation Grounds Co Ltd v Taylor* [1937] HCA 45, (1937) 58 CLR 479 at 498.

198 K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal* 251, 283.

199 D Fox, "Cryptocurrencies in the Common Law of Property" in S Green, D Fox, *Cryptocurrencies in Public and Private Law* (2019) para 6.43.

200 The UKJT refers to "the policy considerations around freedom of speech and expression": UKJT Statement para 63. Additionally, "if anyone is to be given *exclusive* control over information, confidential or otherwise, then such control would serve as a grave impediment of the free flow of information and the freedom of expression": K Low and E Teo, "Bitcoins and Other Cryptocurrencies as Property" [2017] 9(2) *Law Innovation and Technology* 235, 247. Finally, see Thomas J's observation in *Henderson v Walker* [2019] NZHC 2184 that information "is easily acquired, and its free communication is essential to human existence": at [263].

201 "The law of unintended consequences is no part of the law of England and Wales. But it is worth paying attention to it, in an appropriate case, all the same": *Your Response Ltd v Datateam Business Media Ltd* [2014] EWCA Civ 281, [2015] QB 41 at [39] by Davis LJ.

individual wealth.[202] Those objects have societal value because they can be owned by one person to the exclusion of others. Information, on the other hand, normally functions as a means of communication and its value often derives from its ability to be shared. For example, a piece of news is valuable to a publishing company because it can then be shared with the company's readership.[203]

3.42 As Professor Cutts explains, there are other legal means by which to specify how individuals may behave in respect of specific information.[204] While they are outside the scope of this consultation paper, these include (1) the law of confidentiality; (2) the law of intellectual property; (3) the tort of misuse of private information; and (4) data protection rules and regulations.

3.43 These regimes generally allow an individual some control over their information, but that control is more limited than the right to exclusive control conferred by a property right over a thing.[205] Because of the societal importance of information, it is appropriate that control over information is carefully limited. These regimes reflect the fact that, in general, information exists to be shared and disseminated. They allow for some control over dissemination rather than attempting to create absolute exclusivity.

3.44 Below we briefly discuss the law of confidentiality and the law of intellectual property to illustrate how these regimes protect information, without treating it as capable of attracting property rights. A similar analysis would apply to both the tort of misuse of private information,[206] and claims brought under data protection law,[207] neither of which depend on a claimant proving that they have any property right in the private or personal information in question.

The law of confidentiality

3.45 Under the law of confidentiality, a duty to treat information as confidential can arise either by operation of contract or in equity.[208] The cause of action — breach of confidence — is not rooted in any subsisting property right in (confidential)

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202 Or, in the cases of some property with volatile market valuations, a siphon.

203 The mere fact that information may sometimes be more valuable when it is not shared (eg confidential business information) does not change the fact that sharing is still possible and must thus be discouraged (eg through the law of confidentiality).

204 T Cutts, "Crypto-Property? Response to Public Consultation by the UK Jurisdiction Taskforce of the LawTech Delivery Panel" (June 2019) *LSE Policy Briefing 36* p 2.

205 K Low and E Teo, "Bitcoins and Other Cryptocurrencies as Property" [2017] 9(2) *Law Innovation and Technology* 235, 247.

206 For example, in *MGN v Campbell* [2004] 2 AC 457, a well-known model successfully sued a newspaper for publishing covert photographs of her outside Narcotics Anonymous meetings. It was irrelevant that she did not have copyright over the relevant images. Although the claim was brought in breach of confidence, it is now better characterised as a freestanding tort: *Google v Vidal-Hall* [2015] EWCA Civ 311 at [51].

207 For example, the Data Protection Act 2018 imposes duties on those processing personal data, such as the requirement that processing must be "lawful, fair, and transparent": s 86. Persons may bring a claim for compensation if they suffer damage (including distress) as a result of any of these requirements being breached: s 169.

208 C Phipps, W Harman, S Teasdale, *Toulson & Phipps on Confidentiality* (4th ed 2020) para 2-005.

information.[209] Nevertheless, sometimes judgments use imprecise property law-based language to describe this situation. That language sometimes seems to imply that the protection of confidential information is justified by the need to remedy the defendant's infringement of the claimant's property rights.

3.46 For example, in *Herbert Morris Ltd v Savelby*, Lord Shaw remarked that things such as trade secrets or names of customers were the "master's property," not to be "given away by a servant".[210]

3.47 Some parts of the judgments in *Boardman v Phipps* imply that confidential information can be regarded as an object of property rights.[211] Lord Hodson stated that know-how was commercial property which could be valuable, and that this weighed against information not being capable of being property.[212] Viscount Dilhorne said that "it may be that some information and knowledge can properly be regarded as property". Lord Guest said that he saw "no reason why information and knowledge cannot be trust property".

3.48 More recently, Lord Justice Rix suggested in passing — albeit without reference to authority and seemingly without hearing argument on the point — that confidential information was a well-recognised species of property protected by common law.[213]

3.49 All these observations are now well understood, as matter of property law, to be inaccurate.[214] Instead, the law has followed the view of Lord Upjohn in *Boardman v Phipps.* While Lord Upjohn dissented on the outcome of the appeal, his comments on the proprietary status of information have become authoritative. Lord Upjohn stated that information is open to all who can perceive it, and thus not property.[215] Although he conceded that information might be described as property when it is confidential information, he noted that this is only in the limited sense that equity will protect (or

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209 "It is suggested that there are formidable difficulties in the way of any treatment of the action for breach of confidence as an action based on infringement of a proprietary interest.": C Phipps, W Harman, S Teasdale, *Toulson & Phipps on Confidentiality* (4th ed 2020) para 2-016.

210 *Herbert Morris Ltd v Savelby* [1916] 1 AC 688, 714.

211 [1967] 2 AC 46.

212 *Boardman v Phipps* [1967] 2 AC 46, 107.

213 *Veolia ES Nottinghamshire Ltd v Nottinghamshire CC* [2010] EWCA Civ 1214 at [111]. Rix LJ's reasoning has been referred to as "an unfortunate, but unfortunately common, lapse in language": L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para 10-035. The authors suggest that "his Lordship must be understood to mean … that the right to confidential information is a well-recognised species of property, protected by the common law as a *thing in action*.": para 10-035.

214 *Coogan v News Group Newspapers Ltd* [2012] EWCA Civ 48 at [39], by Lord Neuberger (Master of the Rolls); *Force India Formula One Team Limited v 1 Malaysia Racing Team SDN BHD* [2012] EWHC 616 (Ch) at [376] by Arnold J; *Shenzhen Senior Technology Material Co Ltd v Celgard LLC* [2020] EWCA Civ 1293 at [58] by Arnold LJ. See also L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para 1-071.

215 *Boardman v Phipps* [1967] 2 AC 46, 127 to 128.

remedy) a breach of a duty of confidentiality.[216] He concluded that "The real truth is that [information] is not property in any normal sense".[217]

3.50 That confidential information is not capable of attracting property rights further reinforces the conclusion that information, in general, is similarly incapable of doing so.[218]

3.51 This view also aligns with how information has been treated in other statutory contexts — statutes in general do not treat information as an object of property rights but instead create alternative ways in which that information can be protected.

Intellectual property

3.52 In the case of intellectual property rights created by statute, the rights are created over, or in relation to the work and are separate from the work itself. Various statutes govern the provision of protection for:

(1) An "invention," by the granting of a patent.[219]

(2) For certain types of "work," by the creation of copyright.[220]

(3) For a signifying "mark," by the registration of a trade mark.[221]

3.53 The separation of the underlying information and the overlaying statutory property right can be discerned from the language of, for example, the Patents Act 1977, the Copyright, Designs and Patents Act 1988, and the Trade Marks Act 1994.

3.54 Section 30 of the Patents Act 1977, headed "nature of, and transactions in, patents and applications for patents", provides:

> Any patent or application for a patent is personal property (without being a thing in action).

3.55 The language of section 1 makes the separation clear, firstly through its heading, "patentable inventions", which draws a distinction between the invention, comprised of information, and the patent, a property right and, secondly, by providing that a patent may be granted "for an invention".[222] An invention patented under the Patents Act 1977 therefore consists of two discrete things: information comprising an invention and a property right, created by statute, for its protection.

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216 *Boardman v Phipps* [1967] 2 AC 46, 128.

217 [1967] 2 AC 46, 127. The same view was expressed by Lord Walker in *OBG Ltd v Allan* [2007] UKHL 21, [2008] 1 AC 1 at [275]: "Information, even if it is confidential, cannot properly be regarded as a form of property".

218 L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para 10-028.

219 Patents Act 1977, ss 1, 30.

220 Copyright, Designs and Patents Act 1988, ss 1, 2.

221 Trade Marks Act 1994, ss 1, 22.

222 Patents Act 1977, s 1.

3.56 Section 1 of the Copyright, Designs and Patents Act 1988 provides:

> (1) Copyright is a property right which subsists in accordance with this Part in the following descriptions of work.
>
> …
>
> (3) Copyright does not subsist in a work unless the requirements of this Part with respect to qualification for copyright protection are met …

3.57 Importantly, the Copyright, Designs and Patents Act 1988 maintains the separation between copyright and the underlying work by making the copyright contingent on statute rather than on the information comprising the work. The property right "subsists in accordance with" the statutory regime and it expressly "does not subsist in a work unless" in accordance with the statutory regime.[223]

3.58 Section 22 of the Trade Marks Act 1994 provides that "a registered trade mark is personal property (in Scotland, incorporeal moveable property)" and section 9(1) provides that "the proprietor of a registered trade mark has exclusive rights in the trade mark". The Act draws a distinction between a trade mark and a registered trade mark in section 1, thereby creating the separation between the underlying work and the overlaying statutory property right.

3.59 The authors of *The Law of Personal Property* consider the property right created by intellectual property statutes to be a standalone "thing" in itself:

> In the context of intellectual property, this means that the rights conferred by the law, typically statutory, are themselves the *res* or thing.[224]

3.60 This interpretation is supported by Professors McFarlane and Douglas, who suggest that:[225]

> In relation to land and chattels, it is the physical thing which sets the content of the duty owed by the rest of the world; in relation to intellectual property, it is the content of the duties imposed by law which create the "thing" protected.

3.61 A physical thing is capable of attracting property rights because, among other characteristics, its physicality sets the content of the duty owed by the rest of the world and makes it "rivalrous".[226] By contrast, without the duties imposed by law, an invention, a work or a signifying mark is not capable of attracting property rights because information is not of itself excludable or "rivalrous". The law recognises this

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223 Copyright, Designs and Patents Act 1988, s 1.

224 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 9-003.

225 B McFarlane and S Douglas, "Property, Analogy, and Variety" (2022) 42 (1) *Oxford Journal of Legal Studies* 161, 176.

226 For more detail on these concepts, see Chapter 5 and J E Stiglitz, "Economic Foundations of Intellectual Property Rights" (2008) *57 Duke Law Journal* 1693, 1699 to 1700. Also see J Cahir, "The Withering Away of Property: The Rise of the Internet Information Commons" (2004) 24 *Oxford Journal of Legal Studies*, 619, 634 to 635; and H E Smith, "Intellectual Property as Property: Delineating Entitlements in Information" (2007) 116 *Yale Law Journal* 1742, 1822.

and instead attempts to protect these works, inventions or marks by imposing a statutory (artificial) ability to exclude others from using those works, inventions or marks in certain ways.[227] This protects the creators or the registered owners of the works, with a view to encouraging investment in, and distribution of, the works.[228] In this way, a statutory intellectual property right, conceptualised as a thing in itself, is not independent of the legal system — it is the opposite — the property right (the thing) depends wholly on the legal system.

3.62 An underlying invention, work or mark comprising information is therefore not of itself property. It is instead pure information which can be protected by a property right that subsists and operates only to the extent provided by its originating statutory regime.

The Theft Act 1968 and the Senior Courts Act 1981

3.63 As we discuss in Chapter 2, some statutes define the term property extremely broadly. This has led to the suggestion that information is capable of falling within those broad definitions.

3.64 For example, under section 4(1) of the Theft Act 1968, "property" is defined to include:[229]

> money and all other property, real or personal, including things in action and other intangible property.

3.65 The scope of this definition was tested in *Oxford v Moss*.[230] In that case, an engineering student at the University of Liverpool was charged with the theft of information relating to his upcoming exam. The student had obtained an advance copy of the examination paper. However, he could not be charged with the theft of the paper itself because the accepted evidence was that he had always intended to return the paper (so there was no intention permanently to deprive the university of it).[231] Instead, the student was charged with stealing the intangible information contained within (but separate from) the paper. On the prosecution's appeal, Mr Justice Smith upheld the magistrates' decision that information did not fall within the definition of property in the Theft Act.[232]

3.66 The court took a similar approach in its consideration of the definition of "intellectual property" in section 72(5) of the Senior Courts Act 1981. In *Phillips v News Group Newspapers Ltd*, the Supreme Court considered whether "technical and commercial

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227 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 9-004.

228 Whether intellectual property rights achieve this aim is contentious. For example, Boyle equates the evolution of intellectual property rights with a second enclosure movement of "the intangible commons of the mind" which, he argues, restricts the creative potential of future generations rather than contributing to innovation. He suggests that the duration of copyright, for example, keeps important cultural artefacts locked away, see J Boyle, *The Public Domain* (2008) p 45.

229 Theft Act 1968, s 4(1).

230 (1979) 68 Cr App R.

231 A necessary ingredient for a charge of theft: see section 6 of the Theft Act 1968.

232 *Oxford v Moss* (1979) 68 Cr App R 183 at [186].

information" fell within the statutory definition.[233] The manner in which Lord Phillips expressed the court's conclusion is revealing: [234]

> Parliament has made plain that information within [section 72(5)] is, for the purposes of section 72, to be regarded as intellectual property, whether or not it would otherwise be so regarded … *The fact that technical and commercial information ought not, strictly speaking, to be described as property* (the majority view of the House of Lords in *Phipps v Boardman* …) cannot prevail over the clear statutory language.

3.67 The implication of this passage is that information is not ordinarily an appropriate object of property rights, and that the operation of the language in the statute provided a limited exception to this rule.

INFORMATION AND DIGITAL ASSETS

3.68 Any consideration of whether digital assets can attract property rights necessarily requires a close examination of the law in relation to pure information. On one interpretation, all digital things are nothing more than strings of (alphanumerical) data, represented by a stored sequence of bytes.[235] On this analysis, those digital things could be said to be nothing more than pure information. If this interpretation were adopted, there could be no property rights in any digital things at all.

3.69 However, in Chapters 4 and 5, we suggest that some digital assets are so distinct from pure information that the law can treat them as things. We suggest that the criteria described in Chapter 5 will be helpful for the courts and market participants to determine where the line should be drawn between pure information and a (digital) object of property rights.

3.70 Maintaining a distinction between pure information and a (digital) object of property rights is very important for digital assets and was therefore the subject of detailed consideration in the UKJT Statement.[236] While we argue that some digital things are capable of attracting property rights, not every digital thing is so capable. We are therefore highly conscious to ensure that any law reform in the context of digital assets does not overextend property protection to pure information. The risk is that law reform inadvertently (or purposefully) creates a legal regime that undermines the general legal principle that information is not an appropriate object of property rights.

3.71 This risk is not hypothetical — a number of legislative proposals have already been suggested which would have the effect of reducing the free circulation of information. For example, some law reform proposals focus on treating certain pure information

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233 *Phillips v News Group Newspapers Ltd; Coogan v News Group Newspapers Ltd; Gray v News Group Newspapers Ltd* [2012] UKSC 28, [2013] 1 AC 1.

234 *Phillips v News Group Newspapers Ltd; Coogan v News Group Newspapers Ltd; Gray v News Group Newspapers Ltd* [2012] UKSC 28, [2013] 1 AC 1 at [20] (emphasis added).

235 Themselves composed of bits.

236 At paras 59 to 65. The question is also considered in detail in Chapter 8 of L Gullifer, M Bridge, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021). We discuss this analysis in more detail in Chapters 5 and 10.

(such as a private key)[237] as capable of attracting property rights. Others attempt to impose restrictions on the manipulation of information for certain purposes, such as "mining"[238] crypto-tokens.[239]

3.72 We do not consider that this is an appropriate intervention for the law of personal property to make. Instead, our law reform proposals focus on the characteristics of things that can attract property rights, before considering whether any digital assets that exist today exhibit those characteristics. In the next chapter, we explain why we consider a focus on the characteristics of things that attract property rights is preferable to the traditional way in which the property law of England and Wales has relied on the distinction between tangible and intangible things.

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237 For further discussion on this point, see Chapter 10.

238 For more detail on the process of "mining" crypto-tokens, see Appendix 6.

239 See, for example, a proposed (but voted down) addition to the European Union Markets in Crypto Assets framework which would have had the practical effect of banning certain types of crypto-mining: https://www.euronews.com/next/2022/03/14/europe-to-vote-on-limiting-pow-crypto-mining-used-by-bitcoin-and-ethereum. Crypto-mining is already limited in different ways in China, Egypt, Iraq, Qatar, Oman, Morocco, Algeria, Tunisia and Bangladesh: https://fortune.com/2022/01/04/crypto-banned-china-other-countries/.

Chapter 4: A third category of personal property

4.1 Property can be divided into real property (interests in land) and personal property. The law of England and Wales has traditionally recognised two distinct categories of personal property: things in possession, being tangible things, and things in action, being legal rights.[240] It was said in the 1885 case of *Colonial Bank v Whinney* that all personal property falls within one of those categories and that there is no unidentified third category of indeterminate things between the two.[241]

4.2 Certain digital assets are factually different from, and operate in different ways to, both things in possession and things in action. These differences mean that the automatic application of legal rules developed for things that fall within either of the two traditionally recognised categories of personal property is not necessarily appropriate for those digital assets.

4.3 In this chapter we explain the traditional and developing characterisation of these two categories of personal property and explain why some digital assets do not fit neatly in either category. We discuss recent case law which suggests that the law is moving towards the recognition of a third category of personal property, distinct from both things in possession and things in action, although the position remains uncertain.

4.4 We provisionally propose law reform to remove that lingering uncertainty. We agree with the conclusion of the UK Jurisdiction Taskforce ("UKJT") that *Colonial Bank v Whinney* is not good authority for limiting the scope of the categories of personal property generally.[242] Instead, we consider that it is now appropriate for the law of England and Wales to recognise that certain digital assets fall within a third category of personal property. That category of personal property should be distinct from both things in possession and things in action, thereby better able to recognise the idiosyncrasies of those things that fall within it. If objects fell within that third category of personal property, they would also clearly constitute "property" for various legal purposes, including within statutory definitions such as the definition of property in the Insolvency Act 1986.

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240 These are very high-level descriptions and we discuss each in more detail below. Because property rights are rights in relation to things, it is perhaps more intuitive to refer to "rights in things in possession" and to "rights in things in action" to capture the divide between the right and the object of the right, see M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 4-002. See also para 4.100 where we discuss the point that other potential "categories" of personal property could be said to exist.

241 *Colonial Bank v Whinney* (1885) 30 Ch D 261 at 285, by Fry LJ.

242 UK Jurisdictional Taskforce, *Legal Statement on cryptoassets and smart contracts* (November 2019), https://technation.io/lawtechukpanel/ ("UKJT Statement") para 71. In their response to our call for evidence, Professor Fox and Professor Gullifer also suggested that: "The reasoning in [*Colonial Bank v Whinney*] turned on the interpretation of the bankruptcy statutes then in force. It been taken out of context and used as authority for a proposition that it [was] not meant to support".

4.5 At the end of this chapter, we ask consultees whether they agree with our provisional proposal that the law of England and Wales should recognise a third category of personal property.

4.6 Having provisionally proposed that the law should recognise a third category of personal property, we describe in Chapter 5 the criteria that we consider a thing must exhibit before it can properly fall within that third category.

4.7 At the end of Chapter 5 we discuss two options for the development and implementation of our provisional proposals — iterative, common law reform or (limited) statutory intervention. We outline the potential benefits and drawbacks for each, but do not conclude with a preferred option. Instead, we ask consultees for their views.

THINGS IN POSSESSION AND THINGS IN ACTION: AN OVERVIEW

4.8 The first broad category of personal property is things in possession. Under the current law, a thing in possession is any object which the law considers capable of possession.[243] This category includes assets which are "tangible, moveable and visible and of which possession can be taken".[244] An example of this is a bag of gold: possession of a bag of gold gives its possessor a property right which is enforceable against the whole world.[245]

4.9 The second broad category of personal property is things in action. Things in action are often described in a narrow sense: "rights in things in action…are asserted by taking legal action or proceedings".[246] But the category of things in action is sometimes given a much broader meaning as a residual class of personal property. In other words, the broad use of the term thing in action captures any personal property that is not a thing in possession. Common examples of "things in action" are debts, rights to sue for breach of contract, and shares in a company.

4.10 One distinctive feature of things in possession[247] is that they are tangible things which exist regardless of whether anyone lays claim to them, and regardless of whether any legal system recognises or is available to enforce such claims. In contrast, things in action have no independent, tangible form and exist only insofar as they are recognised by a legal system. This means that the presence of a thing in action in the

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243 While this might seem question-begging, the point is simply that the category is broad enough to encompass all of those things capable of possession, as opposed to any subset.

244 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-018; and *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10 (Ch), [2013] Ch 156 at [44] by Stephen Morris QC. See also Financial Markets Law Committee, *Issues of legal uncertainty arising in the context of virtual currencies* (July 2016) p 6, http://fmlc.org/wp-content/uploads/2018/03/virtual_currencies_paper_-_edited_january_2017.pdf.

245 This is the standard account of the effect of a property right. A full account also needs to recognise that, in the common law's system of relative title, this really means a right good against the whole world except against those with a superior, possessory right. For example, the finder of a gold watch has a legal right by virtue of their possession of the gold watch. This right is good against the world except against the person who lost the watch (and anyone with a valid right prior to the person who lost the watch, and so on).

246 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 4-002.

247 As opposed to the property rights in respect of things in possession, which are of course legal rights.

world is dependent upon there being both a party against whom the right can be enforced and a legal system willing to recognise and enforce the right.

4.11 The law of England and Wales has traditionally assumed that all objects of property rights must fall within one or other of the two categories. In *Colonial Bank v Whinney*, Lord Justice Fry said:[248]

> All personal things are either in possession or action. The law knows no *tertium quid* ["third thing"] between the two.

4.12 There is therefore a question as to whether a thing can be property at all if it is neither a thing in possession nor a thing in action. This question has become increasingly relevant in the modern world, where courts have been asked to consider whether novel things — most often some kind of digital asset — are capable of attracting personal property rights.

4.13 This question is not necessarily easy to answer for digital assets. The courts have held that intangible things cannot be things in possession.[249] This has been taken to include things in electronic or digital form.[250] However, although not currently capable of being possessed as a matter of law, a digital asset exists as a matter of fact, regardless of the recognition given to it by any legal system, and regardless of whether anyone lays a claim to it. And certain types of digital asset may be susceptible to similar types of control, and to similar means of interference, as tangible objects.

4.14 On the other hand, some digital assets do not sit comfortably with the traditional meaning of a thing in action — there is no obvious obligor against whom a right in relation to some digital assets can be enforced. The same cannot be said of traditional things in action such as a debt or of a right to sue.

4.15 The law of England and Wales has shown great flexibility in this respect. The courts have been willing to conclude that certain things (often digital assets) are capable of attracting property rights, even where the thing in question does not neatly fit within either of the traditionally recognised categories of personal property.[251] The courts have done this, either expressly or impliedly, in respect of, for example, milk quotas,[252]

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248 (1885) 30 Ch D 261 at 285, referring to Sir William Blackstone, *Commentaries on the Laws of England* (vol 2 1765-1769) p 389.

249 *OBG Ltd v Allan* [2007] UKHL 21.

250 *Your Response Ltd v Datateam Business Media Ltd* [2014] EWCA Civ 281, [2015] QB 41. D Fox, "Cryptocurrencies in the Common Law of Property", in S Green, D Fox, *Cryptocurrencies in Public and Private Law* (2019) para 6.29. The UKJT Statement came to the same conclusion for crypto-tokens at para 67: "[crypto-tokens] cannot be physically possessed: they are purely 'virtual'".

251 A Ray, Dr Clifford and Dr Roberts suggest that "that traditional legal rules and principles may not apply easily into online realms": see A Ray, D Clifford, H Roberts, "The rise and rise again of digital assets – reconceptualising data as property" *Modern Studies in Property Law Conference 2022* at [4].

252 *Swift v Dairywise (No 1)* [2000] 1 WLR 1177, [2000] BCC 642 concerned the question of whether a milk quota was property coming under s 436 Insolvency Act 1986.

European Union carbon emission allowances,[253] export quotas[254], waste management licences,[255] and crypto-tokens.[256]

4.16 Despite these cases, there is no express clarity or confirmation as to whether a third category of personal property beyond things in possession and things in action exists[257] and, if it does, how the parameters of that third category should be defined. No recent authority has conclusively settled these issues. For example, in *AA v Persons Unknown*,[258] the court did not find it necessary to answer these questions to conclude that a crypto-token could attract property rights more generally. This might be because the courts of England and Wales feel constrained by the authority of *Colonial Bank v Whinney*,[259] which has been used as authority for the proposition that a third category of personal property does not exist.

4.17 Below, we consider the current law in more detail. We explain why we think that it is now appropriate for the law of England and Wales to explicitly recognise that certain things (namely certain digital assets) fall within a third category of personal property due to their idiosyncratic nature.

THINGS IN POSSESSION

4.18 The category of things in possession is currently limited to physical things.[260] Things in possession are things which are "tangible, moveable, visible and of which possession can be taken".[261] Although visibility is less important now,[262] the concepts of "tangible" and "moveable" both suggest that the tangible nature of an object lies at the heart of

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253 *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10 (Ch), [2012] Env LR D4. This case considered the property status of carbon emission allowances in the context of restitutionary and unconscionable receipt claims. The court concluded that a carbon emission allowance was "some form of 'other intangible property'" at [60] by Stephen Morris QC.

254 *A-G of Hong Kong v Chan Nai-Keung* [1987] 1 WLR 1339 at 1342 where the Privy Council said: "Their Lordships have no hesitation in concluding that export quotas in Hong Kong although not 'things in action' are a form of 'other intangible property'".

255 *Re Celtic Extraction Ltd* [2001] Ch 475.

256 In *AA v Persons Unknown* [2019] EWHC 3556 (Comm), [2020] 4 WLR 35, the High Court of England and Wales adopted the reasoning of the UKJT Statement, acknowledging that "[crypto-tokens] are neither [things] in possession nor are they [things] in action".

257 In many ways, the category of things in action, perhaps necessarily, has become something of a residual category. Some argue that is now includes everything that is not a thing in possession and capable of encompassing certain intangible things and (some) digital assets. See eg, M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 4-006, and generally the UKJT Statement.

258 [2019] EWHC 3556 (Comm), [2020] 4 WLR 35. We discuss this case in more detail in paras 4.44 to 4.45 below.

259 (1885) 30 Ch D 261 at 285.

260 Note however, that in Electronic Trade Documents (2022) Law Com No 405 we suggested law reform that would make certain electronic trade documents amenable to possession.

261 *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10 (Ch), [2013] Ch 156 at [44] by Mr Stephen Morris QC.

262 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-018, in which the authors suggest that visibility is unlikely to be necessary because very small things (such as a cell line are still capable of attracting property rights. See *Moore v Regents of the University of California* 51 Cal. 3d 120, 793 P.2d 479 (Supreme Court of California.

the concept of things in possession. Over time, this has led the legal concept of possession to presuppose the existence of a tangible thing to which property rights can relate.[263]

4.19 Many judgments ground their legal reasoning in the concept of tangibility. For example, in *Your Response Ltd v Datateam Business Media Ltd*,[264] Lord Justice Moore-Bick suggested that the dividing line between tangible and intangible property in the common law had been justified on the basis that the former is amenable to being possessed, and thereby controlled, physically.[265] Intangible property in his view, "consist[ed] of rights to benefits obtainable only by action" and did not have those properties.[266]

4.20 Tangibility therefore remains an important (if not determinative) characteristic of things in possession — some physical control over a tangible thing is generally required to engage the factual and legal concepts of possession.[267] Although this view was challenged by the claimants in *OBG Ltd v Allan*,[268] the House of Lords affirmed it. However, in our report on electronic trade documents,[269] we suggested that while the concept of tangibility helps accurately to describe those things amenable to possession, it is not — nor should it be — a necessary criterion for the law's recognition of amenability to possession.[270] So, in the limited context of electronic trade documents, we recommended that it should be possible for electronic versions of trade documents to be possessable, provided that they meet certain criteria. In our report on electronic trade documents, we identify elements of the concept of possession which we think can be extrapolated to electronic trade documents, notwithstanding that they are treated by the law as being intangible.

4.21 As we explain in detail in our report on electronic trade documents, policy and practical considerations in that particular context led us to recommend that electronic trade documents should be capable of possession.[271] In summary, possession has a core role in the current functionality of paper trade documents such as bills of lading and bills of exchange, both at common law and in domestic statutes. Possession of a trade document is important for establishing which party has certain rights and entitlements, how the documents are custodied and how they are used as collateral. Using possession as a determinative concept allows electronic trade documents to be

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263 In *Manchester Ship Canal v Vauxhall Motors* [2019] UKSC 46, [2020] 2 All ER 81 at [59], Lord Briggs suggested that there are two elements of possession which must be met cumulatively: (1) a sufficient degree of *physical* custody and control; and (2) an intention to exercise such custody and control on one's own behalf and for one's own benefit.(emphasis added) This case is about possession of land, but the statement is of a more general application.

264 [2014] EWCA Civ 281, [2014] 3 WLR 887.

265 [2014] EWCA Civ 281, [2014] 3 WLR 887 at [13].

266 [2014] EWCA Civ 281, [2015] 3 WLR 887 at 892 by Moore-Bick LJ.

267 D Fox, "Cryptocurrencies in the Common Law of Property", in S Green, D Fox, *Cryptocurrencies in Public and Private Law* (2019) para 6.29.

268 [2007] UKHL 21, [2008] 1 AC 1.

269 Electronic Trade Documents (2022) Law Com No 405.

270 Electronic Trade Documents (2022) Law Com No 405 para 5.9.

271 Electronic Trade Documents (2022) Law Com No 405 from para 2.61.

plugged directly into an existing legal framework in respect of a limited category of documents which already enjoy a special status in law. In effect, this allows functionally equivalent documents to be treated by law in the exact same way regardless of their medium.

4.22 We do not consider therefore that the concept of possession is necessarily limited to tangible things. But we recognise that the legal concept of possession is nonetheless bound up with tangibility. It has traditionally relied on the physical boundaries of a thing to help define the contours of legal duties in relation to that thing.[272]

4.23 As we discuss in detail in Chapter 11, we do not think that the arguments for using possession as the operative concept in respect of electronic trade documents are as persuasive in respect of other forms of digital assets. One reason is that other digital assets, in general, do not seek to replicate the legal functionality of a specific form of tangible personal property in the same way that electronic trade documents attempt to replicate exactly the legal functionality of paper trade documents. Indeed, crypto-tokens were designed to avoid replicating certain of those features. Most obviously, crypto-tokens and certain other digital assets were designed to facilitate communication on a global and trust-minimised basis, without the need for physical exchanges of tangible things.[273] So there is an argument that these types of data objects were designed explicitly so that they did not engage the factual and legal concepts of possession.

4.24 We consider that it is possible to formulate a concept that is equivalent to (or at least analogous to) possession when applied to digital assets which is free of possession's historic associations and limitations. The most obvious candidate for this equivalent or analogous concept is "control". We discuss the concept of control and our reasons for preferring it to possession in detail in Chapter 11.

4.25 This approach necessarily means that digital assets will continue not to be capable of possession. We think that drawing analogies between physical things and digital assets is helpful to a point but, inevitably, those analogies cannot be wholly applicable. This is particularly true in respect of those digital assets that rely on novel and idiosyncratic technology, such as public key cryptography.

THINGS IN ACTION

4.26 Things in action are, in general, things in relation to which rights "are asserted by taking legal action or proceedings".[274] The classic example of a thing in action is a debt claim. For someone (a creditor) to have a debt claim, this presupposes the existence of a debtor. Accordingly, it makes little sense to speak of a debt claim as having a standalone existence, independent of the debtor-creditor relationship. Instead, the claim, and consequently the property right in the claim, only exist because

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272 B McFarlane and S Douglas, "Property, Analogy, and Variety" (2022) 42(1) *Oxford Journal of Legal Studies* 161, 166.

273 Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008) at 1 and 8: https://nakamotoinstitute.org/bitcoin/.

274 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 4-002.

two parties have come to an agreement. As such, the category of things in action has been described as rooted in the law of obligations rather than the law of property.[275]

4.27 This does not mean that it is necessary to start legal proceedings to recover a thing in action, including a debt claim. For example, the amount owing under a debt claim is recovered when the debtor makes a repayment in full. However, things in action are usually conceptualised as rights against a particular obligor, or obligations-based. The consequence of this is that they are things which are created, and which are extinguished, entirely through the application of legal rules. They are purely creatures of the legal system.[276]

4.28 In contrast, tangible things exist regardless of the application of legal rules. For example, a court could not deny the physical existence of a car, although it could determine whether something fell within the definition of "a car" for the purposes of specific legal rules which apply to cars, such as speed limits.[277]

An expanded category of things in action

4.29 It is possible to treat the category of things in action as extremely broad and either positively defined as including all "intangible things" enforceable by taking legal proceedings,[278] or negatively defined as including anything that is not a thing in possession.

4.30 There is some judicial support for these interpretations. For example, in *Colonial Bank v Whinney*, Lord Justice Fry explained that the category of things in action extended beyond things like debts and held that shares fell within the category:[279]

> Undoubtedly, there has been, not only in common language but in legal language, an extension of the application of the term, "[thing] in action" beyond its early meaning.

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275 J Allen, "Property in digital coins" (2019) *European Property Law Journal* 64, 81.

276 For example, the proper discharge of a debt relies on the repayment of a specified sum of money, which engages a number of legal rules including, among others, the law of contract and legal tender rules. Sanitt suggests that the category of things in action "contains property which is purely legal in existence — it can be created or annihilated by a court decision or legislation without creating any inconsistency with the real world". A Sanitt, "What sort of property is a cryptoasset?" (2021): https://www.nortonrosefulbright.com/en/knowledge/publications/26ade77a/what-sort-of-property-is-a-cryptoasset#:~:text=A%20cryptoasset%20also%20has%20an,a%20%E2%80%9Cthing%20in%20possession%E2%80%9D.

277 A Sanitt, "What sort of property is a cryptoasset?" (2021): https://www.nortonrosefulbright.com/en/knowledge/publications/26ade77a/what-sort-of-property-is-a-cryptoasset#:~:text=A%20cryptoasset%20also%20has%20an,a%20%E2%80%9Cthing%20in%20possession%E2%80%9D.

278 The parameters of this category could be expanded in a more nuanced way, by stretching or expanding the type of "obligation" that a thing in action could be based on. This type of reasoning is already, to an extent, present in the case law concerning quotas, such as milk quotas, which do not necessarily give a holder an enforceable right against a counterparty.

279 (1885) 30 Ch D 261 at 276.

4.31 This bolsters the argument that this category of personal property has always[280] been of a residual nature, covering all intangible things enforceable by taking legal proceedings — which could not, by virtue of their intangibility, be things in possession.[281]

4.32 Moreover, as the UKJT's *Legal Statement on cryptoassets and smart contracts* ("UKJT Statement") explains,[282] Lord Justice Fry approved a passage from *Personal Property* by Joshua Williams. This suggested that the category of things in action was always intended to capture new kinds of property which had previously been unknown to the law:[283]

> In modern times [sc. by the 19th century] … several species of property have sprung up which were unknown to the common law … . For want of a better classification, these subjects of personal property are now usually spoken of as …[things] in action. They are, in fact, personal property of an incorporeal nature…

4.33 Lord Justice Fry gave his judgment in the Court of Appeal. On appeal, the House of Lords did not conclusively rule on the classification of personal property into two distinct and inflexible categories. Lord Blackburn simply recognised that "in modern times lawyers have accurately or inaccurately used the phrase '[things] in action' as including all personal chattels that are not in possession".[284] This suggests that the House of Lords was prepared to accept that things in action could be seen as a broad, residual class of all things not in possession, although they reserved comment on the accuracy of such classification.[285]

4.34 It is therefore possible to conclude that the category of things in action is capable of functioning as a residual category which is perfectly able to encompass new things that might attract property rights. In *Colonial Bank v Whinney*, the relevant things were shares deposited as security. The question before the court was whether those shares were things in action within the meaning of the Bankruptcy Act 1883, and the court held that they were. In subsequent cases, new things in question have included milk quotas, European Union carbon emission allowances, export quotas, waste management licences, and crypto-tokens.

4.35 This broader view of things in action is supported by the authors of *The Law of Personal Property*, who suggest that it would be more appropriate to speak of a category of "immaterial property", which would include both things in action and other intangibles.[286] Watterson also advocates for a wider "immaterial property" category, saying that things in action strictly defined are only one kind of intangible personal

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280 Or, at least, has for the last 150 years.

281 (1885) 30 Ch D 261 at 286.

282 UKJT Statement para 75.

283 *Colonial Bank v Whinney* (1885) 30 Ch D 261 at 275.

284 UKJT Statement para 76, referring to *Colonial Bank v Whinney* (1866) 11 App Cas 426 at 440.

285 UKJT Statement para 76.

286 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 4-006.

property.[287] Taking the argument a step further, Professors Low and Hara make the nuanced case that crypto-tokens could correctly fall within the category of things in action: [288]

> Narrowly conceiving their rights as the right to the unique data strings on a particular distributed ledger, or put slightly differently, the right to have their unspent transaction output (UTXO) locked to their public address with a particular ledger, would prevent the reification of [crypto-tokens] from interfering with any conceivable legitimate liberties of any stranger, facilitating the recognition of [crypto-tokens] as property with rights [towards everyone, or against the world].

4.36 In cases involving new things such as digital assets, it is possible therefore that the courts will treat the thing in question as falling within the "wider" or "residual" class of things in action. This may have been the intention of the court in the recent case of *Fetch.ai v Persons Unknown*.[289] Or the court might simply accept that the thing in question is capable of attracting property rights, without categorising that thing, as it was prepared to do in *Vorotyntseva v Money-4 ltd* [290] and *Ion Science v Persons Unknown*.[291] Alternatively, the court might adopt a similar approach to that of the UKJT Statement:[292]

> Our view is that if a [crypto-token] does not embody a legally-enforceable right or obligation then it is neither necessary nor useful to classify it as a thing in action. If it is necessary to classify it at all, then a [crypto-token] is best treated as being another, third, kind of property, as the court was prepared to do with the EU carbon emission allowances in *Armstrong v Winnington*.

4.37 The courts previously indicated that they found this reasoning compelling in *Ruscoe v Cryptopia*[293] and *AA v Persons Unknown*.[294]

4.38 We suggest that the third approach described by the UKJT (as set out in the quote above) is the most authentic and appropriate approach. This is because there is value in maintaining the conceptual integrity of the things in action category as, in general, being one that encompasses rights (grounded in obligations) that can be "asserted by taking legal action or proceedings".[295] However, where a thing exists independently of

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287 S Watterson, "Contextual and Conceptual Foundations of Private Law Claims Involving Cryptocurrencies" in C Mitchell and S Watterson, *The World of Maritime and Commercial Law: Essays in Honour of Francis Rose* (2020) 329 p 337.

288 K Low and M Hara, "Cryptoassets and property" in S van Erp and K Zimmermann, *Edward Elgar Research Handbook on EU Property Law* (Forthcoming), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4103870.

289 [2021] EWHC 2254 (Comm), [2021] 7 WLUK 601 at [9]. At para 4.46 below, we suggest that the court may have instead been (correctly) referring to a right against a custodial crypto exchange as a thing in action.

290 [2018] EWHC 2596 (Ch) at [13].

291 21 December 2020 (unreported) at [11].

292 UKJT Statement para 86(a).

293 [2020] NZHC 728, [2020] 22 ITELR 925 at [117] and [124].

294 [2019] EWHC 3556 (Comm), [2020] 4 WLR 35 at [71] to [74].

295 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 4-002.

other persons and independently of the legal system, we do not think it is conceptually coherent for that thing to be treated as a thing in action. We consider in more detail some recent cases that have considered these issues below.

RECENT CASE LAW DEVELOPMENTS

4.39 The common law has already shown itself to be highly flexible and willing to develop to embrace things that are neither things in possession nor things in action in the narrow sense. The development is clear in the law of England and Wales and beyond: courts around the world have been asked to deal with similar issues and have reached similar conclusions. Many of the most recent cases involve some form of crypto-token as the thing in question. In general, these cases show how the conventional categories of the common law of personal property are being challenged and redefined by the realities of a rapidly digitising economic and financial system.[296]

England and Wales

4.40 In *Swift v Dairywise (No 1)*,[297] the court considered whether a milk quota fell within the definition of property under section 436 of the Insolvency Act 1986, and whether it was capable of being the subject matter of a trust. Mr Justice Jacob answered both questions affirmatively, but did not rule on whether a milk quota was a thing in action or a thing in possession. Instead, he suggested that (emphasis added):[298]

> [A milk] quota is not the same as other sorts of property often offered by way of security. *Its legal nature is unique*. It gives the holder who produces milk an exemption from a levy which would otherwise be payable.

4.41 Similarly, in *Armstrong v Winnington*,[299] the court considered the "somewhat novel nature"[300] of European Union allowances ("EUAs"), which enable the holder to emit up to one tonne of carbon dioxide equivalent per year per allowance. Mr Stephen Morris QC (sitting as a Deputy High Court Judge) found that an EUA was not a thing in action in the narrow sense, as it cannot be claimed or enforced by action.[301] Instead, he suggested that an EUA might be regarded as similar to, or a modern version of, a

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296 J G Allen, H Wells, M Mauer, M Bacina, Cryptoassets in the Courts: Emerging Trends and Open Questions in Private Law from the First 10 Years (2022) (Forthcoming).

297 [2000] 1 WLR 1177, [2000] BCC 642.

298 [2000] 1 WLR 1177 at 1179.

299 [2012] EWHC 10 (Ch), [2013] Ch 156.

300 [2012] EWHC 10 (Ch), [2013] Ch 156 at 177.

301 "[An EUA] Does not give the holder a "right" to emit CO2 [in the sense of a right that is enforceable by civil action]. Rather it represents at most a permission (or liberty […]) or an exemption from a prohibition or fine": [2012] EWHC 10 (Ch), [2013] Ch 156 at 172.

thing in possession,[302] but ultimately concluded that an EUA was "some form of 'other intangible property'".[303]

4.42 These cases demonstrate that the courts of England and Wales are prepared to consider whether novel things that are treated by market participants as an "independent asset having an economic value"[304] can attract property rights. Recently, the courts have been faced with the same issue in the specific context of crypto-tokens.[305]

4.43 In general, courts have been prepared to find that crypto-tokens can be the object of property rights for the limited purposes of proprietary injunctions,[306] freezing orders[307] or as the subject matter of a trust.[308] For the purposes of these (often *ex parte*[309] and without notice) hearings, the courts did not consider it necessary to opine on the proper categorisation of crypto-tokens within the law of property.

4.44 However, in *AA v Persons Unknown*,[310] the court did consider the appropriate legal categorisation of crypto-tokens. In that case an insurance company tried to recover bitcoin it had paid to a ransomware attacker in exchange for a decryption software for its client. It was able to trace the bitcoin to an account controlled by the first and second defendants. It sought a proprietary injunction against them, as well as the operators of the exchange to which the account was linked. After a detailed analysis, Mr Justice Bryan suggested that it would be "fallacious" to proceed on the basis that the law of England and Wales recognises no form of property other than things in

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302 [2012] EWHC 10 (Ch), [2013] Ch 156 at 173. However, he did not hear argument on the point and he was not prepared to find that an EUA was a thing in possession.

303 [2012] EWHC 10 (Ch), [2013] Ch 156 at 173. For the alternative view that EUAs are best characterised as regulatory licences that were themselves capable of amounting to intangible property of some sort, see L Gullifer, M Bridge, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-029.

304 *Swift v Dairywise (No 1)* [2000] 1 WLR 1177, [2000] BCC 642 at 1179 by Jacob J, referring to the judgments of Mr Justice Chadwick in *Faulks v Faulks* [1992] 1 EGLR 9 and the Court of Appeal in *Harries v Barclays Bank Plc* [1997] 2 EGLR 15.

305 In Chapter 10 we discuss in detail the legal nature of crypto-tokens and whether they are capable of demonstrating the criteria described in Chapter 5.

306 See further Chapter 19 paras 142 to 147. In *Vorotyntseva v Money-4 ltd* [2018] EWHC 2596 (Ch), Birss J granted a freezing order in relation to specific ether and bitcoin. Similarly, *Ion Science v Persons Unknown* (21 December 2020, unreported) involved an interim application for a proprietary injunction and a worldwide freezing order in respect of crypto-tokens. Butcher J considered that there was a serious issue to be tried that crypto-tokens could attract property rights, and explicitly referred to the UKJT Statement and *Ruscoe v Cryptopia Ltd (in liquidation)* [2020] NZHC 728 (High Court of New Zealand), which we discuss below.

307 See further Chapter 19 paras 142 to 147. *Robertson v Persons Unknown* (unreported, 15 July 2019); *Vorotyntseva v Money-4 ltd* [2018] EWHC 2596 (Ch); *Fetch.ai v Persons Unknown* [2021] EWHC 2254 (Comm); [2021] 7 WLUK 601.

308 *Wang v Darby* [2021] EWHC 3054 (Comm), [2022] Bus LR 121. In that case it was common ground between the parties that crypto-tokens such as Tezos could attract property rights.

309 That is, an application is made by one party in the absence of another, as is often the case in applications to prevent the dissipation of assets pending substantive proceedings. The difficulty with such applications is that judges are required to make rulings without the benefit of legal argument from both sides of the dispute.

310 [2019] EWHC 3556 (Comm), [2020] 4 WLR 35.

possession and things in action.[311] He explicitly recognised the difficulty in the classification of crypto-tokens:[312]

> *Prima facie* there is difficulty in treating bitcoins and other [crypto-tokens] as forms of property: they are neither [things] in possession nor are they [things] in action. They are not [things] in possession because they are virtual, they are not tangible, they cannot be possessed. They are not [things] in action because they do not embody any right capable of being enforced by action.

4.45 Citing the full reasoning of the UKJT Statement on the point, Mr Justice Bryan held that a crypto-token could be property even if it was not a thing in action in the narrow sense.[313] In doing so, he found that crypto-tokens met the *Ainsworth* criteria of being definable, identifiable by third parties, capable of assumption by third parties, and having some degree of stability or permanence.[314]

4.46 The case of *Fetch.ai v Persons Unknown*[315] involved crypto-tokens held on a crypto-token exchange called Binance and an application for, among other things, a proprietary injunction, worldwide freezing order, and ancillary orders for the disclosure of information. In his judgment, Judge Pelling QC held that crypto-tokens could attract property rights. However, in contrast to the judgment in *AA v Persons Unknown*,[316] Judge Pelling QC described the "assets credited to the first applicant's accounts on the Binance Exchange" as things in action.[317] This has been referred to as a "marked departure from the reasoning set out in the UKJT Statement (endorsed in *AA v Persons Unknown*)".[318] Given that Binance Exchange generally operates as a custodial exchange, we consider that that the better interpretation of this judgment is that the court correctly classified the applicant's right against Binance Exchange as a thing in action.[319] We discuss the distinction between the classification of crypto-tokens themselves and crypto-tokens held in custodial exchanges in greater detail in Chapter 16. If the court was referring to self-custodied crypto-tokens however, it is unclear on what basis the court concluded that a crypto-token was, in itself, a thing in action.

4.47 Despite this last judgment, we suggest that these cases cumulatively show that the courts of England and Wales have already begun the iterative process of carving-out a category of personal property that is distinct from things in possession and from things in action. At the very least, the courts are comfortable to "stretch traditional

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311 *AA v Persons Unknown* [2019] EWHC 3556 (Comm), [2020] 4 WLR 35 at [58].

312 Above at [55].

313 Above at [59].

314 Above at [59].

315 [2021] EWHC 2254 (Comm), [2021] 7 WLUK 601.

316 *AA v Persons Unknown* [2019] EWHC 3556 (Comm), [2020] 4 WLR 35.

317 *Fetch.ai v Persons Unknown* [2021] EWHC 2254 (Comm), [2021] 7 WLUK 601 at [9].

318 J G Allen, H Wells, M Mauer, M Bacina, "Cryptoassets in the Courts: Emerging Trends and Open Questions in Private Law from the First 10 Years" (Forthcoming 2022).

319 We understand that no specific submissions were made on the categorisation of personal property point. However, we also recognise that the judgment does refer to "private keys" which are normally associated with non-custodial or self-custody holding arrangements.

definitions and concepts to adapt to new business practices".[320] This trend is also apparent in the international context.

Cases from other common law jurisdictions

Singapore

4.48 *B2C2 ltd v Quoine pte ltd*[321] involved a series of algorithmically executed trades carried out on a crypto exchange platform that were subsequently reversed by the platform operator without the consent of the trading counterparty.[322] B2C2, a party to the trades, argued that the reversal of the trades was either in breach of contract or in breach of trust. The trust issue raised the question of whether the crypto-tokens held by the exchange could be objects of property rights. At first instance, Justice Simon Thorley sitting in the Singapore International Commercial Court considered that crypto-tokens satisfied the *Ainsworth* criteria, and so were capable of attracting property rights. But he left open the question of the categorisation of crypto-tokens as a particular type of property.[323] The Singapore Court of Appeal found that there was no intention to create a trust, so did not need to rule on whether crypto-tokens could attract property rights.[324]

New Zealand

4.49 *Ruscoe v Cryptopia*[325] was a case in which a large crypto-token exchange went into voluntary liquidation after losing a significant quantity of crypto-tokens to a hack. The question before the High Court was whether the remaining crypto-tokens were held on trust for the account holders, or whether they formed part of the exchange's assets and so part of its insolvent estate. The High Court held that crypto-tokens could attract property rights, treating them as a "species of intangible personal property and clearly an identifiable thing of value".[326] In doing so, the Court described how the *Ainsworth* criteria applied to crypto-tokens.[327]

4.50 In his judgment, Justice Gendall criticised the idea that a crypto-token must necessarily fall into one of the two categories of personal property to attract property

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320 UKJT Statement para 77.

321 [2020] SGCA(I) 02 (Singapore Court of Appeal); *B2C2 Ltd v Quoine Pte Ltd* [2019] SGHC(I) 03 (International Commercial Court).

322 The operator wanted to reverse the trades because they were carried out on 19 April 2017 at an exchange rate of either 9.99999 or 10 bitcoins for 1 ether. This was at a rate approximately 250 times the market rate of about 0.04 bitcoins for 1 ether at the time.

323 *B2C2 ltd v Quoine pte ltd* [2019] SGHC(I) 03, Simon Thorley J: "There may be some academic debate as to the precise nature of the property right" at [142].

324 *Quoine pte ltd v B2C2 ltd* [2020] SGCA(I) 02 at [144]. The Court did, however, recognise the arguments in favour of crypto-tokens attracting property rights, while noting that difficult questions remain as to how to categorise crypto-tokens within property law.

325 [2020] NZHC 728, [2020] 22 ITELR 925 (High Court of New Zealand).

326 *Ruscoe v Cryptopia Ltd (In liquidation)* [2020] NZHC 728, [2020] 22 ITELR 925 at [69].

327 Above at [102] to [121].

rights, calling it a "red herring".[328] He explicitly recognised that crypto-tokens exhibited different characteristics to things in action (in the narrow sense):[329]

> It would be ironic that something [a crypto-token] that might be said to have more proprietary features than a simple debt is deemed not to be [capable of attracting property rights] at all when a simple debt qualifies [as capable of attracting property rights].

4.51 Without definitively suggesting a third category of personal property, both of these cases show how courts elsewhere in the common law world feel able to apply existing principles of property law to things that do not neatly fall within existing categories of personal property.

USA

4.52 While US case law has repeatedly affirmed that crypto-tokens can attract property rights, this finding has often taken place "in the context of a specific statutory definition or right of action".[330] In other words, the US courts have tended not to ask fundamental but abstract questions as to the nature of personal property rights with respect to crypto-tokens. Instead, they generally focus on more functional questions, such as whether crypto-tokens can be the subject matter of a specific cause of action or remedy or whether they trigger a specific regulatory perimeter. Professor Allen and others describe this process as "'backwalking' from a specific issue into a fundamental one" but recognise that the approach "brings the value of pragmatism and inductive reasoning from real-world experience".[331]

4.53 Many of the earliest US cases were mostly concerned with the proper characterisation of crypto-tokens under criminal and capital markets statutes.[332] Since then, cases have considered whether crypto-tokens could constitute "money",[333] constitute "a commodity",[334] or "be the fitting object for an action in conversion".[335]

4.54 While these cases suggest that the US courts are comfortable in treating new things as capable of attracting property rights, there is little uniform, general legal theory to support this. However, as we discuss below,[336] the proposed amendments to the Uniform Commercial Code are likely to go a long way towards the general legal

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328 *Ruscoe v Cryptopia Ltd (In liquidation)* [2020] NZHC 728, [2020] 22 ITELR 925 at [123].

329 Above [123] to [124].

330 J G Allen, H Wells, M Mauer, M Bacina, Cryptoassets in the Courts: Emerging Trends and Open Questions in Private Law from the First 10 Years (2022) (Forthcoming).

331 Above

332 Above p 9.

333 *United States v Harmon* 474 F.Supp.3d 76 (2020); *United States v Faiella* (2014) 39 F.Supp.3d 544; *SEC v Shavers* [2013] WL 4028182; *United States v. Petix*, 15-CR-227A (W.D.N.Y. Dec. 1, 2016); *State v Espinoza* F14-2923 (22 July 2016).

334 *CFTC v My Big Coin Pay Inc* 1:18-cv-10077-RWZ (D) Msct September 28, 2018); *CFTC v McDonnel* (2018) 287 F.Supp.3d 213

335 *BDI Capital LLC v Bulbul Investments LLC* 446 F.Supp.3d 1127 (2020); *Kleiman v Wright* [2018] WL 6812914; *Archer v Coinbase Inc* 53 Cal App 5d 266 (2020).

336 At para 4.88.

categorisation of "digital assets" within US legal theory. Such principles-based clarity is perhaps particularly helpful in a jurisdiction in which legal precedent is developed through a combination of fragmented, state-by-state statutory reform, common-law precedent and policy-led regulatory enforcement decisions and settlement negotiations.[337]

Cases from civil law jurisdictions

4.55 Courts in many civil law jurisdictions have held that crypto-tokens are things of value, while avoiding the doctrinal questions as to what those things are, or whether they can attract property rights.[338] As Professor Allen and others suggest, this is in large part because:[339]

> Many civil law jurisdictions (including Japan, Germany, Greece, Poland, and others) do not recognise intangible objects as fitting objects of all property rights, particularly the right of ownership.

4.56 The term "ownership" is generally used to designate the best interest in an object that exists,[340] and the person with the best interest in an object is accordingly described as the object's owner.[341] We recognise that it may be more difficult for civil law jurisdictions to "fit" new things into their existing categories of personal property, particularly where those things are intangible. This is because, very broadly speaking, many civil law systems require a thing to have a tangible or physical form for it to be recognised as an appropriate object of all property rights, including ownership.[342] However, it is possible that this doctrinal difficulty might, over time, guide civil law systems towards a broader recognition of some type of "third category" of personal property. In other words, "we may have reached the point [where] 'native' data objects

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337 John Glen MP explicitly recognised that the legal framework in England and Wales has advantages over the United States in this respect: "Unlike the EU and US, the UK has a small number of regulators, and central government sets the overall framework and can take decisive action. So, we can move very nimbly." See, Keynote Speech by John Glen, Economic Secretary to the Treasury, at the Innovate Finance Global Summit during Fintech Week 2022: https://www.gov.uk/government/speeches/keynote-speech-by-john-glen-economic-secretary-to-the-treasury-at-the-innovate-finance-global-summit.

338 For example, s 73 of the German Criminal Code provides for the seizure of "anything" obtained by, or for, an unlawful act, meaning that crypto-tokens could be objects of property for the purposes of German criminal law. Also in the context of criminal law proceedings, South Korean courts referred to bitcoins as "intangible property": J G Allen, H Wells, M Mauer, M Bacina, "Cryptoassets in the Courts: Emerging Trends and Open Questions in Private Law from the First 10 Years" (Forthcoming 2022) p 20, referring to C S Anh, 'South Korea: Confiscation of bitcoin Criminal Assets' (2021) IFLR https://www.iflr.com/article/b1lp1whss0ktny/south-korea-confiscation-of-bitcoin-criminal-assets.

339 J G Allen, H Wells, M Mauer, M Bacina, Cryptoassets in the Courts: Emerging Trends and Open Questions in Private Law from the First 10 Years (2022) (Forthcoming).

340 And the ability to carve-out lesser interests from that (superior) interest. See J Penner, *The Idea of Property in Law* (1997) p 151.

341 See eg D Sheehan, *The Principles of Personal Property Law* (2nd ed 2017) p 6. However, this has been challenged in eg S Green and J Randall, *The Tort of Conversion* (2009) p 81: "In a system where title is relative, there is no room for the concept to which non-lawyers would refer as 'ownership'".

Professor Sarah Green is the Commissioner for Commercial and Common Law at the Law Commission of England and Wales, and lead Commissioner for this project.

342 D Carr, "Cryptocurrencies as property in civilian and mixed legal systems", in S Green, D Fox, *Cryptocurrencies in Public and Private Law* (2019). See the discussion from para 712.

demand recognition in their own right, however disruptive this may be for the dogmatic structure of inherited legal categories."[343]

4.57 Examples of this can already be seen in some civil law-based systems, including Japan, Liechtenstein, and Switzerland as well as in international contexts.

Japan

4.58 In Japan, the property status of crypto-tokens was considered after the bankruptcy of the Mt. Gox crypto exchange in 2014. In August 2015, the Tokyo District Court held that bitcoin was not a thing that was capable of ownership within Article 85 of the Japanese Civil Code.[344] That finding prevented the argument that customers of the exchange had a proprietary claim to the bitcoin held by the exchange (as opposed to merely a personal claim against the exchange).

4.59 Between the onset of bankruptcy proceedings and 2018, the 200,000 remaining bitcoin held by the bankruptcy estate appreciated in market value, eventually overtaking the total legal claim value of all creditors (valued as at the date of insolvency, converted into Japanese Yen). This created a surplus of value which could have technically been returned to shareholders instead of creditors (following the repayment of all creditors in full).[345] Partly to avoid this result, creditors and the bankruptcy trustee worked to convert the bankruptcy into civil rehabilitation proceedings, which eventually occurred in June 2018[346]

4.60 This had two important effects. First, under civil rehabilitation proceedings, non-monetary claims are not converted into monetary claims at the time of commencement of the civil rehabilitation proceedings. This meant that creditors' claims did not need to be converted from bitcoin ("BTC") to Japanese Yen as at the date of the bankruptcy of Mt. Gox (or as at the date of the civil rehabilitation proceedings). Second, the civil rehabilitation proceedings allowed for a more flexible distribution process to creditors under a civil rehabilitation plan which was proposed to creditors by the rehabilitation trustee.[347] In addition, the civil rehabilitation proceedings did not rely on a determination of the property status of bitcoin (or otherwise) under Japanese law. In this way, the rehabilitation trustee was able to use the civil rehabilitation proceedings to achieve a similar result to what might have been

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343 J G Allen, H Wells, M Mauer, M Bacina, Cryptoassets in the Courts: Emerging Trends and Open Questions in Private Law from the First 10 Years (2022) (Forthcoming), eferencing P Palka, 'Virtual Property: Towards a General Theory' (2017), 150: cadmus.eui.eu/handle/1814/49664.

344 For a detailed consideration of this case and a translation of the judgment, see: L Gullifer, M Hara, C Mooney, "English translation of the Mt. Gox judgment on the legal status of bitcoin prepared by the Digital Assets Project" https://www.law.ox.ac.uk/business-law-blog/blog/2019/02/english-translation-mt-gox-judgment-legal-status-bitcoin-prepared.

345 See N Lister and M Kimber, "Bitcoin: exposure or exposed? Risks relating to cryptocurrency exchange insolvency" (2018) 33 9 *Butterworths Journal of International Banking and Financial Law* 538, 539.

Matthew Kimber is the lead lawyer on this project.

346 See Mt. Gox payout guide and calculator, which includes an overview of the process to date: https://blog.wizsec.jp/2021/02/mtgox-claim-calculator.html.

347 See announcement and FAQ: https://www.mtgox.com/img/pdf/20180622_announcement_en.pdf. See also Notice of Confirmation Order of Rehabilitation Plan (20 October 2021) https://www.mtgox.com/img/pdf/20211020_announcement_en.pdf.

achievable under bankruptcy proceedings had the creditors had a property interest in the bitcoin held by Mt. Gox.

4.61 Since the above case, an amendment to the Japanese Payment Services Act added the concept of "Virtual Currency".[348] Lee and Van de Looverbosch suggest that this statutory intervention has brought crypto-tokens squarely within the sphere of property law:[349]

> Expressly departing from the conclusion of the Mt. Gox judgment, the definitions of both categories of Virtual Currency lead with the words "property value". Whilst the definitions are rather intricate, many [crypto-tokens], such as Bitcoin, Ethereum and Litecoin, seem to fall within the first category. Thus bitcoins are now considered a sort of 'property value' under Japanese law.

China

4.62 The issue of the status of crypto-tokens as objects of property rights also arose in China. In this case, a person had filed a lawsuit demanding the return of one bitcoin. In February 2021, the Shanghai Baoshan District People's Court held that the bitcoin must be returned to the claimant. However, this was not done, leading to further proceedings between the parties.[350]

4.63 The Shanghai High People's Court issued a statement related to the case, in which it said that Bitcoin was "virtual property". The Court said that Bitcoin "[had] a certain economic value and [conformed] to the property's attributes". Therefore, "the legal rules of property rights are applied for protection."[351]

Liechtenstein

4.64 A different approach was taken by the Government of Liechtenstein, who recognised that digital assets constituted an important technological development and legislated for "a comprehensive and technology-neutral approach to regulating the entire token economy".[352] As part of the reform process, the Government explicitly acknowledged the difficulties under civil law systems of expanding the concept of ownership to an intangible "token", noting that this approach would "require deep inroads into property law, as many provisions would have to be rewritten".[353] Instead, the Government of

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348 An unofficial English translation of the Japanese Payment Services Act is available at https://www.japaneselawtranslation.go.jp/en/laws/view/3078/en.

349 J Lee and M Van de Looverbosch, Property and Data: A Confused Relationship (2021). J Lee, A Darbellay A *Data Governance in AI, FinTech and RegTech: Law and Regulation in the Financial Sector* (2022): https://ssrn.com/abstract=3995492.

350 Bitcoin.com, "Shanghai High Court Declares Bitcoin Virtual Asset With Economic Value Protected by Chinese Law" (12 May 2022): https://news.bitcoin.com/shanghai-high-court-declares-bitcoin-virtual-asset-with-economic-value-protected-by-chinese-law/.

351 Above.

352 See the Government Principality of Liechtenstein Ministry of General Government Affairs and Finance at: https://impuls-liechtenstein.li/en/blockchain/.

353 J G Allen, H Wells, M Mauer, M Bacina, Cryptoassets in the Courts: Emerging Trends and Open Questions in Private Law from the First 10 Years (2022) (Forthcoming) p 20, referring to LLV, *Report and Application of the Government to the Parliament of the Principality of Liechtenstein concerning the Creation of a Law on*

Liechtenstein chose to implement comprehensive statutory reform — the Liechtenstein Token and TT Service Provider Act (the "Liechtenstein Token Act") — which provides for the tokenisation of assets and rights.[354] The Liechtenstein Token Act creates a new legal object — a token — and a specific, separate regime for the regulation and use of those tokens. In this way, the Liechtenstein Token Act side-stepped the doctrinal civil law difficulties of recognising intangible objects as objects of property rights and instead created a standalone, specific statutory regime.

Switzerland

4.65 Switzerland has also taken steps to ensure that it provides an environment which is friendly to the development of crypto-token systems, in part by implementing the Federal Act on the Adaptation of Federal Law to Developments in Distributed Ledger Technology.[355] The statute amends various other pieces of legislation such as the Code of Obligations, the Debt Collection and Bankruptcy Act and the Financial Market Infrastructure Act.[356] This instrument enables the tokenisation of rights, claims, and financial instruments through "ledger-based securities".[357] These reforms were prompted by the recognition that existing statutes did not perfectly apply to new things created using distributed ledger technology. The statutory intervention effectively creates a technology-specific regime that applies existing legal principles and rules to those new types of object, without fundamentally challenging the existing legal principles.[358]

UNIDROIT Working Group

4.66 The UNIDROIT Digital Assets and Private Law Working Group ("the UNIDROIT Working Group") is developing a set of international principles designed to facilitate transactions in digital assets.[359] The purpose of the UNIDROIT Working Group is to describe proprietary principles that can apply to transactions and legal arrangements involving certain digital assets. The principles are intended to facilitate an international standard of best practice and framed such that they can be applied by Member States

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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 (2019), https://impuls-liechtenstein.li/wp-content/uploads/2021/02/Report-and-Application-TVTG-extract.pdf p 62.

354 The unofficial translation of the 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 (The Liechtenstein Token Act) is available at https://impuls-liechtenstein.li/wp-content/uploads/2021/02/Report-and-Application-TVTG-extract.pdf.

355 Art 973d Federal Act on the Adaptation of Federal Law to Developments in Distributed Ledger Technology 2020 https://www.newsd.admin.ch/newsd/message/attachments/60601.pdf.

356 Baker McKenzie, "Switzerland: Swiss Legislative Package on DLT" (23 January 2021) https://www.globalcompliancenews.com/2021/01/23/switzerland-swiss-legislative-package-on-dlt-07012021/

357 Art 973d Federal Act on the Adaptation of Federal Law to Developments in Distributed Ledger Technology 2020 https://www.newsd.admin.ch/newsd/message/attachments/60601.pdf

358 We note however that the Act describes "ledger based securities" using the language of "rights". See, for example, Art. 973d: https://www.newsd.admin.ch/newsd/message/attachments/60601.pdf.

359 See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 1: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

regardless of their underlying conceptual foundations of property law.[360] Therefore, these principles should also be applicable by Member States whose domestic legal systems are civil law-based.

A THIRD CATEGORY OF PERSONAL PROPERTY

4.67 Above, we explain why we do not think that digital assets fit neatly into either of the existing common law categories of personal property. We demonstrated that the courts, both in this jurisdiction and elsewhere, have also identified this problem, whether explicitly or implicitly, but nonetheless have been creative about finding ways legally to recognise such assets as capable of attracting property rights.

4.68 Although the flexibility of the common law has allowed for incremental development, we consider that there are good reasons why the law of England and Wales should explicitly recognise a third category of personal property.

(1) A third category of personal property would enable a more nuanced consideration of emergent objects of property rights, including digital assets.

(2) There is strong support for such a development from stakeholders (including academics and market participants) working in this area.

(3) This development is consistent with international law reform in this area.

(4) Providing clear answers to questions as to the property status of things will provide a strong, principled, and consistent legal foundation for regulatory, procedural, and policy-based questions relating to such things.

We consider each in turn.

A nuanced consideration of emergent types of thing – now and in the future

4.69 We suggest that explicitly recognising a third category of personal property would be a useful development because it would allow for a more nuanced consideration of new, emergent things.

4.70 Explicitly recognising a third category of personal property would allow the law to develop by analogy with things in possession or things in action where appropriate, while also recognising that certain things do not fall neatly within either category. A distinct, third category will better allow the law to focus on attributes or characteristics of the things in question, without being fettered by analysis or principles applicable to other types of personal property. This is particularly important in the context of digital assets. As we discuss in detail in Chapters 5 to 10, some digital assets exhibit inherent characteristics or attributes that make them function much more like objects than mere records, information, or data.

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[360] "Background", Digital Assets and Private Law: https://www.unidroit.org/work-in-progress/digital-assets-and-private-law/#1456405893720-a55ec26a-b30a.

4.71 In this respect, we agree with the view of Professor Allen and others that:[361]

> [An analysis of the proprietary nature of digital assets] necessarily requires close engagement with the systems in which they exist — including their technical frameworks as well as the social networks of human actors that animate them and make it the case that a bitcoin, for example, is an object of value that is relevant to the law at all.

4.72 As we note in Chapter 10, some digital assets rely on both novel technology and social or network effects for their inherent properties and value. If the law is to recognise and protect the commercial intentions of sophisticated market participants that use sophisticated technology, it will need to develop rational legal principles suitable for these socio-technical systems. The reality is that many of these legal principles will not be completely analogous with existing concepts. US Federal Reserve Chair Jerome Powell recognised this point in a speech on 23 March 2022:[362]

> Our existing regulatory frameworks were not built with a digital world in mind.
>
> Stablecoins, central bank digital currencies, and digital finance more generally, will require changes to existing laws and regulation or even entirely new rules and frameworks.

4.73 In this consultation paper we argue that a third category of personal property should be defined by a principles-based approach to the question of whether a thing can attract property rights.[363] In other words, that the question of whether an object can attract property rights ought to be determined by reference to consistent principles, as opposed to value judgements as to whether that particular object should attract property rights.[364] This will help the common law to develop in a logical and consistent manner, without binding it to references to existing technology or technical implementations.

4.74 This is fundamental to the argument of this paper: that law ought to be able to take a principled, nuanced, and idiosyncratic approach to the legal treatment of new technology. The law of England and Wales is highly flexible, and should remain that way so as to facilitate and protect the development of a completely new type of data object. We think that explicitly recognising a third category of personal property will

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361 J G Allen, H Wells, M Mauer, M Bacina, Cryptoassets in the Courts: Emerging Trends and Open Questions in Private Law from the First 10 Years (2022) (Forthcoming)

362 AP News, "Powell: Digital currencies will require new regulations" (23 March 2022), https://apnews.com/article/cryptocurrency-technology-business-jerome-powell-19b85098aa7b568f71bde73c6d1d6a42. Stablecoins are crypto-tokens with a value that is pegged, or tied, to that of another currency, commodity or financial instrument. The "peg" might be based on assets held by the issuer, or on a mathematical algorithm and is generally intended to remain on a "stable" (often 1:1) basis over time, although this has proven to not always be the case.

363 In the context of regulatory issues, this was an approach that was endorsed by market participants at the first CryptoSprint events hosted by the FCA in May and June 2022, see: https://www.fca.org.uk/firms/cryptoassets/cryptosprint, at "Cross-cutting themes".

364 We recognise however that, in arguing for a third category of personal property, we make an implicit value judgement that some digital assets ought to attract property rights. We discuss our reasons for this broader value judgement in more detail in Chapter 1.

allow the law to do this without being fettered by legal rules developed specifically by reference to categories that are no longer exhaustive.

Academic and market support for a third category of personal property

4.75 Some commentators think the development of a third category of personal property is unnecessary. For example, the authors of *The Law of Personal Property* suggest that engaging in a semantic debate on the characterisation of personal property is a "red herring" and that the category of things in action is simply "co-extensive as a category with intangibles".[365]

4.76 However, our research, our discussions with stakeholders and the responses to our call for evidence suggest that there is strong support from some academics and market participants for the development of a third category more capable of encompassing new things, particularly digital assets.

4.77 Many commentators recognise that the emergence of new types of digital assets that do not fit neatly into existing categories of personal property warrants a corresponding evolution in legal recognition and protection. Professors Sarra and Gullifer suggest that:[366]

> A reasonably strong argument can be made that the emergence of digital assets … necessitates the adoption of this third category [of personal property] and that what is really important is whether the contenders for inclusion in this category meet the criterion as to what can be "property". If such a miscellaneous category were to be part of English law … rules could then be fashioned specifically to deal with this type of property.

4.78 Professor Allen suggests that a consistent and principled approach to the categorisation of immaterial objects is a logical prior step to the characterisation of those things for prudential, capital markets, tax, and other regulations. He argues that recognising a distinct, third category of personal property will "make our law of property in general more future-proof, as a large and increasing proportion of our economy is concerned with such immaterial objects".[367]

4.79 Many make the point that the recognition of a third category of personal property would reduce the historic reliance on tangibility as a proxy test for the characteristics of things which can attract certain property rights.[368]

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365 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-049.

366 J Sarra, L Gullifer, "Crypto-claimants and bitcoin bankruptcy: Challenges for recognition and realization" (2019) *International Insolvency Review* 233, 245.

367 J Allen, "What's Offered in an ICO? Digital Coins as Things" (2018), https://dx.doi.org/10.2139/ssrn.3140499, 1 and 3.

368 Professor Sarah Green explains the reasons why there is a strong connection between the legal concept of "possession" and the factual characteristic of tangibility. There was no need to consider the essence of possession as a legal concept – or what tangibility tells us about a thing – in a world in which the only things of value were tangible. S Green, "To have and to hold? Conversion and intangible property" (2008) 71(1) *Modern Law Review* 114, 115.

4.80 In this respect, Professor Fairfield argues that a focus on the characteristics of things — including intangible things — will be increasingly important in the modern world where the boundaries between an intangible object of property rights and information are delicate:[369]

> When courts fail to make precise distinctions about scarcity and rivalry, and instead rely on the crude proxy of [tangibility], they both wrongly apply intellectual property protections to non-intellectual property intangible [objects], and deny the protections of basic property law to the owners of such [intangible] objects.

4.81 Professor Green recognises how the common law can take a nuanced and idiosyncratic approach to the legal characterisation of new things and argues (in the context of crypto-tokens) that:[370]

> [Crypto-tokens] are best dealt with through the application and analogical development of existing legal doctrine … . For the common law of property, this would involve abandoning the long-standing, but increasingly untenable, rule that the only objects of property are [things] in action and [things] in possession… . The substance and function of [crypto-tokens] tell us more about their amenability to a property analysis than does their virtual form.

4.82 Ken Moon, a Consultant at AJ Park Law Ltd, takes a similar view, and argues that the current "centuries old legal categories and classifications of 'things' are out of date" in the digital world: they are "inadequate and in urgent need of updating".[371]

4.83 In arguing for a wide third category of personal property, Johan David Michels and Professor Millard suggest that:[372]

> A more modern view would instead focus on the *characteristics* of the object in question to determine whether it is a good fit for property law. Such a characteristics-based test provides the flexibility needed to respond to new commercial and technological developments.

4.84 Many respondents to our call for evidence made similar arguments. The City of London Law Society ("CLLS") suggested a "third category" of personal property as follows:[373]

Professor Sarah Green is the Commissioner for Commercial and Common Law at the Law Commission of England and Wales, and lead Commissioner for this project.

369 J Fairfield, "Bitproperty" (2015) 88 *Southern California Law Review* 805, 865.

370 S Green, "Cryptocurrencies: The Underlying Technology", in S Green, D Fox, *Cryptocurrencies in Public and Private Law* (2019) para 1.20.

371 K Moon, "Is Software Goods, or even Property? A Recommendation for Sui Generis Categories" (2018), *Society for Computers and Law Magazine*.

372 J D Michels, C Millard, "The New Things: Property Rights in Digital Files" [2022] *The Cambridge Law Journal* 1, 20.

373 City of London Law Society, "Digital assets: the limits of the concept of possession" (2021) p 9: https://www.citysolicitors.org.uk/storage/2021/08/Digital-Assets-The-Limits-of-the-Concept-of-Possession-13-08-21.pdf.

> We use the term "third category" property right to refer to a digital asset that, upon a proper analysis of its inherent features, does not display the indicia of either a [thing] in possession or a [thing] in action.

4.85 The Financial Markets Law Committee ("FMLC") said:

> That a digital asset cannot be categorised within the existing common law understanding of property as a thing in possession or a thing in action should not, however, preclude it from being treated as property and enjoying property rights under English Law. To address this, the FMLC proposes the creation of a third category of personal property which addresses the distinct attributes of digital assets.

4.86 The Law Society of England and Wales also expressed support for a distinct, third category of personal property. They said:

> We support … the creation of a new third category of property that is a digital asset (narrowly defined …), allowing for a clearly defined legal position (and therefore rights) in respect of such digital assets.

4.87 The consistency with which these arguments are expressed by academic commentators and market participants suggests that there is widespread market support for the explicit recognition of a third category of personal property. This argument is strengthened by the fact that international legal developments have already arrived at a similar conclusion.

Consistency with international legal developments

4.88 In the United States, the Uniform Law Commission's Uniform Commercial Code and Emerging Technologies Committee (the "ULC") recommended changes to the United States Uniform Commercial Code ("UCC"). The proposed amendments include a new UCC Article 12 that would govern the transfer of property rights in certain intangible digital assets that have been or may be created using new technologies.[374]

4.89 The purpose of the reforms is, broadly, to recognise that concepts of personal property under the UCC can apply to certain intangible assets that are created using existing novel technology, including technology yet to be developed.[375]

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[374] See Uniform Law Commission, *Amendments to the Uniform Commercial Code* (2022), art 12: https://www.uniformlaws.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=67fe571b-e8ad-caf8-4530-d8b59bdca805.

These assets are defined as "controllable electronic records" and include, for example, certain types of virtual currency and nonfungible tokens. See Uniform Law Commission, *Draft - Uniform Commercial Code and Emerging Technologies - 2022 May 16-18 Meeting* p 3: https://www.uniformlaws.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=fa5c6c1b-c612-c453-b39d-8b4e3e8496f3.

[375] See Uniform Law Commission, *Draft - Uniform Commercial Code and Emerging Technologies - 2022 May 16-18 Meeting* p 144: https://www.uniformlaws.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=fa5c6c1b-c612-c453-b39d-8b4e3e8496f3.

4.90 The fact that the ULC decided that a new Article of the UCC was required suggests that they recognised the idiosyncratic nature of things that fall within their definition of "controllable electronic record". In that sense, it shows their preference that US law should treat these objects of property in a nuanced and technology-specific way.

4.91 The UNIDROIT Working Group takes a similar approach to the ULC. However, the UNIDROIT Working Group suggests overarching principles that UNIDROIT Member States should apply as a matter of private law. The UNIDROIT Working Group explicitly recognises the difficulties that some member states face when dealing with questions as to the property status of new things, particularly intangible things. Nevertheless, their law reform proposals are robustly put:[376]

> These Principles cover private law issues and in particular proprietary rights relating to digital assets. [The Principles provide], as a matter of principle, that [Member States' law] should provide that digital assets can be the subject of proprietary rights. All rules provided in these Principles are built on this premiss. However, the question whether digital assets can be the subject of proprietary rights has been controversial in several jurisdictions. As courts in multiple high profile cases have considered that digital assets are the subject of proprietary rights, and several authoritative authors have expressed that digital assets should be the subject of proprietary rights, these Principles advise [Member] States to end legal uncertainty on this issue and make explicit that digital assets can be the subject of proprietary rights.

4.92 We consider that this international legal guidance provides strong support for the law of England and Wales to explicitly recognise a third category of personal property rights that would be able to better embrace digital assets. We consider that our proposals will be important in this respect as they will provide a clear and logical foundation from which to develop further, more conceptually difficult, legal principles on an equally clear and logical basis (including regulatory intervention if and where appropriate). If our law does not evolve in this way, it risks being overtaken and therefore overshadowed by other jurisdictions, including the US and those UNIDROIT Member States that implement the recommendations of the UNIDROIT Working Group more swiftly.

4.93 In the short term, this would risk the jurisdiction of England and Wales being less able to attract talent and innovation in the digital asset space, along with financial capital. It would also risk the jurisdiction of England and Wales failing to achieve Government's stated ambition of becoming a global hub for digital assets, and in particular, crypto-tokens and crypto-token systems.[377] In the longer term, as digital assets continue to integrate into modern financial systems, this would risk this jurisdiction losing its status at the forefront of financial services, and the law of England and Wales losing its pre-eminence as the law of choice for those services.

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376 See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 11: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

377 See, Keynote Speech by John Glen, Economic Secretary to the Treasury, at the Innovate Finance Global Summit during Fintech Week 2022: https://www.gov.uk/government/speeches/keynote-speech-by-john-glen-economic-secretary-to-the-treasury-at-the-innovate-finance-global-summit.

OUR PROPOSALS

Principles-first conceptual foundations

4.94 We provisionally propose that the law of England and Wales should explicitly recognise a third category of personal property to allow for a nuanced and idiosyncratic approach to the legal characterisation of new things. We think this will help to provide a strong conceptual foundation from which other, more complex legal issues in relation to new types of thing (including new digital assets) can be determined. In general, we think that this will have three principal benefits.

4.95 First, it will help ground policy-based initiatives in clear, consistent, and logical principles. We think that it is difficult to provide well-reasoned, thoughtful, and effective prudential, capital markets, tax, and other regulations in relation to new objects of property rights without a principled recognition of their peculiar and novel features. A strong conceptual foundation will help the executive, legislature, and judiciary to create distinct, technology-specific regimes that might apply to those novel objects of property, while remaining consistent with wider legal principles and the treatment of other objects of property.

4.96 Second, a strong conceptual foundation will help the courts to develop consistent legal principles more widely. In many cases, the legal characterisation of a thing will be a preliminary issue to a regulatory or criminal law question or to the availability of a particular cause of action and associated remedies. However, because of the difficulty in categorising new objects of property (particularly digital assets), the courts have avoided ruling definitively on the proper legal categorisation of those things. Instead, they adopt a flexible approach to the property question by first answering specific questions, often under a statutory regime and often of a regulatory or procedural nature. Professor Allen and others refer to this approach as an "overriding trend for courts to 'backwalk' into basic private law questions".[378] Developing clear principles applicable to a third category of personal property will help to reverse this trend.

4.97 Third, a strong conceptual foundation will allow the law of England and Wales to remain able to deal with other novel objects of property in the future. Because the test for whether a thing can attract property rights will be designed by reference to principles or characteristics it will be possible to apply that test to novel things as and when they arise. This should help the jurisdiction of England and Wales remain competitive in the modern world.

4.98 In the following chapter, we discuss how the parameters of our proposed distinct third category of personal property should be defined by reference to the criteria that we consider a thing must exhibit before it can properly fall within that third category.

4.99 At the end of Chapter 5 we discuss two options for the development and implementation of our proposals — iterative, common law reform or (limited) statutory intervention. We consider the advantages and disadvantages of each, but do not conclude on a preferred option. Instead, we ask consultees for their views.

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[378] J G Allen, H Wells, M Mauer, M Bacina, "Cryptoassets in the Courts: Emerging Trends and Open Questions in Private Law from the First 10 Years" (2022) (Forthcoming).

A final note on terminology

4.100 In this chapter and this consultation paper we use the term third category of personal property to describe a common law[379] category of personal property distinct from both things in possession and things in action. In adopting this terminology we acknowledge the argument that other distinct categories of personal property might already exist at law (candidates include patents, other statutorily created intellectual property rights or allowances such as carbon allowances, and other intangibles).[380] However, we nonetheless adopt the term third category as shorthand. In part, as a reference to Lord Justice Fry's judgment in *Colonial Bank v Whinney.*[381] In part, as a convenient and readily understandable term, and in part because we consider that a distinct category of personal property that is better suited to encompassing new digital assets will become increasingly important.

Consultation Question 1.

4.101 We provisionally propose that the law of England and Wales should recognise a third category of personal property. Do you agree?

[379] As distinct from statutorily created. We consider that even if the existence of a third category of personal property was recognised by statute, that it would remain a common law category and not a statutorily created category.

[380] See M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) paras 9-005 to 9-007.

[381] (1885) 30 Ch D 261. See discussion at para 4.11 above.

Chapter 5: The characteristics of data objects

5.1 In Chapter 4, we suggested that certain digital assets do not fall neatly within the categories of things in possession or things in action. However, we argued that some digital assets are nonetheless capable of attracting personal property rights. We provisionally proposed that the law should explicitly recognise a distinct, third category of personal property which is better able to encompass certain types of digital asset.

5.2 In this chapter, we set out our provisional criteria that describe the characteristics of those things that we think should fall into that distinct, third category. We derive these criteria from an analysis of the legal concept of property set out in Chapter 2 and from existing common law precedent and academic and market commentary. In Chapters 6 to 10, we demonstrate and test these criteria by applying them to a range of different, broad sub-categories of digital assets. We describe those digital assets that exhibit these criteria, and so fall within our proposed third category of personal property, as data objects.

A THIRD CATEGORY OF PERSONAL PROPERTY: DATA OBJECTS

5.3 As discussed in Chapter 2 at paragraph 2.16, the legal concept of property consists of three principal elements. Those elements are (1) the existence of a thing with particular characteristics; (2) a person's liberty to put the thing to various uses; and (3) the law conferring on that person a legal right to exclude others from the thing.

5.4 In considering the criteria for a third category of personal property, we are principally concerned with the first of these elements. It is the fact that a particular thing exhibits certain characteristics that makes it suitable as an object of property rights.[382]

A note on terminology

5.5 In this consultation paper, we use the term digital assets as a broad, umbrella term. We also recognise a variety of different, broad sub-categories of digital asset, reflecting differences in the ways that digital assets exist, can be transferred or transmitted, and are used.[383] However, when evaluating whether a particular thing or a particular digital asset falls within our third category of personal property, we provisionally propose a single set of criteria, rather than different tests for different sub-categories of digital asset. Although our focus is on the law of England and Wales, we also draw from legal and market developments in other jurisdictions where those developments usefully illustrate an aspect of our reasoning.

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382 We discuss this in more detail in Chapter 2.

383 We discuss digital files and digital records in Chapter 6, email accounts and certain in-game digital assets in Chapter 7, domain names in Chapter 8, carbon emission trading schemes in Chapter 9 and crypto-tokens in Chapter 10.

5.6 We use the term data objects to describe those things that satisfy the criteria set out in this chapter, such that they fall within our new suggested third category of personal property.

5.7 We recognise the argument that the terms digital[384] and electronic are used more commonly or colloquially than the term data, particularly when describing digital assets in a broad sense. For this reason, there is an argument that the term digital object or electronic object might be a more appropriate label for those things that fall within our suggested third category of personal property. We note, for example, that The International Institute for the Unification of Private Law Digital Assets and Private Law Working Group (the "UNIDROIT Working Group") use both terms. In their principles, an "'electronic record' consists of information stored in an electronic or other intangible medium, which is capable of being retrieved" and a digital asset is "an electronic record which is capable of being subject to control".[385]

5.8 The term electronic is broader than the term digital.[386] While we consider that the latter is a more accurate term for the types of thing that we envisage meeting our provisional proposals at present, we recognise also that it might not strictly be necessary to represent a thing that satisfies our criteria in digital form. The thing in question could theoretically instead be represented by a different type of data (for example, symbols that are not represented in bit format, or some form of analogue data, or perhaps a qubit[387]). For this reason, we consider that the term data is the most expansive, grounding term or concept to use. This is consistent with the UNIDROIT Working Group's use of the grounding concept of "information". We discuss more specific reasons for the use of the term data in our explanation of our first criterion at paragraph 5.14 onwards below.

5.9 For those reasons, and even though the term digital has a well-recognised and broad colloquial use, we use the term data object as an overarching descriptive term for objects that fall within our proposed third category of personal property. That is, for those things which satisfy all three of our proposed criteria.

Overview of the criteria necessary for a thing to be a data object

5.10 In summary, we provisionally propose that a thing should be recognised as falling within our third category of personal property if:

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384 The term digital implies that a thing has been converted into a digital format, in which information is organised into bits. The bit is the most basic unit of information in computing and digital communications and represents a logical state with one of two possible values (most commonly represented as a 1 or a 0).

385 See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 7: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

386 This is recognised by the wording of some Acts of Parliament. For example, existing legislation in general refers to "electronic" rather than digital. See: s 74 Marriage Act 1949; s 56 Copyright, Designs and Patents Act 1988; s 1(5) Carriage of Goods by Sea Act 1992; Value Added Tax Act 1994, sch 10B; Electronic Communications Act 2000, Part II; Companies Act 2006, sch 4, Part 3; s 113 Wireless Telegraphy Act 2006; s 17 Immigration Act 2016; s 37(1) Taxation (Cross-border Trade) Act 2018.

387 Qubits are the basic building block of quantum information. Quantum computing and quantum information lie far beyond the scope of this consultation paper, and so we only mention this as a passing, hypothetical reference.

(1) it is composed of data represented in an electronic medium, including in the form of computer code, electronic, digital or analogue signals;

(2) it exists independently of persons and exists independently of the legal system; and

(3) it is rivalrous.[388]

5.11 We also discuss divestibility as a separate common characteristic of data objects, but do not propose that the characteristic of divestibility should be a gateway criterion.

5.12 These three criteria aim to ensure that only things that are suitable objects of property rights fall within our new suggested third category of personal property.[389]

5.13 We explain each criterion in turn.

FIRST CRITERION: DATA REPRESENTED IN AN ELECTRONIC MEDIUM

5.14 Our first criterion for things which fall within our proposed third category of personal property is that the thing in question must be composed of data[390] represented in an electronic medium, including in the form of computer code, electronic, digital or analogue signals.[391] We use this criterion for two principal reasons.

5.15 First, to distinguish those things that can fall within our suggested third category of personal property from things in possession, which are constituted of a collection of physical particles or matter within a defined boundary of three-dimensional space.[392] Such tangible objects are not composed of data represented in an electronic medium, including in the form of computer code, electronic, digital or analogue signals. They are not capable of being processed by a computer, nor do they have an existence in the form of computer code. While we recognise that all tangible things have an informational attribute to them, we do not consider them to be composed of data

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388 A resource is rivalrous if use of the resource by one person (or a group of persons) necessarily prejudices the ability of others to make equivalent use of it at the same time. We think that a rivalrous resource is likely to be excludable — that it is normally possible to exclude others from a rivalrous resource. We discuss the relationship between rivalrousness and excludability in more detail at para 5.56 below.

389 We note that these criteria are broadly similar to the criteria that we recommended in our electronic trade documents report and draft bill. The bill provides that a trade document in electronic form that satisfies the relevant criteria is capable of possession — that is, it is a thing in possession. We discuss the reasons why we do not think that possession is an appropriate concept for the broader category of data objects in more detail in Chapter 11.

390 Including a data structure. A data structure is a specialised means of organising and storing data in computers in such a way that we can perform operations on the stored data more efficiently.

391 See T Cutts, "Possessable Digital Assets: Response to the Electronic Trade Documents Law Commission Consultation Paper No 254 and Call for Evidence on Digital Assets 2021" (2021) *LSE Law Policy Briefing Paper no.47*, 3: "We could more simply pursue a definition that pointed directly at computer data. We could, for instance say: 'has an existence in the form of computer code'. The notion of rivalry would do the work necessary to exclude mere computer code, over which one could not exert exclusive control." We are also grateful to Professor Cutts for discussions with us on this issue.

392 Subject to our recommendations in Electronic Trade Documents (2022) Law Com No 405.

represented in an electronic medium in any normal sense.[393] The driving purpose of this criterion is to exclude tangible objects (in the normal sense)[394] from our suggested third category of personal property. We would also be interested in feedback on whether this criterion adequately excludes tangible things.

5.16 We would also be interested in feedback on whether this criterion ought to include any further defining parameters. For example, the UNIDROIT Working Group define an "electronic record" as "consist[ing] of information stored in an electronic or other intangible medium, which is capable of being retrieved."[395] They suggest that:

> It is implicit in the requirement that the information be retrievable that the information also must be retrievable in a form that can be perceived. It follows that an electronic record would not include, for example, oral communications that are not stored or preserved or information that is retained only through human memory.

5.17 We think, for example, that the "capable of being retrieved" requirement might help to exclude things that could potentially be treated as data-based (such as the light flowing through fibre-optic cables or, potentially, human memories) from falling within our suggested third category of personal property.[396] However, we would be interested in hearing feedback as to whether the data that constitutes certain data objects is always "capable of being retrieved".[397]

5.18 Second, we use this criterion to acknowledge that an important constituent part of data objects is that they have an informational quality and are represented in an electronic medium which, in general, is optimised for processing by computers. The criterion allows us to recognise that the things that fall within our suggested third category are constituted of data that is uniquely instantiated[398] within a particular network or system. We do not use the criterion of intangibility to describe that data because we explicitly recognise that the networks or systems themselves do have a tangible, albeit highly distributed, existence.[399] However, we think that it is important to

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393 This would come close to fantasy, or a *The Matrix*-esque environment where all things were simply treated as being composed of information. See *The Matrix* (1999).

394 As we discuss at para 3.8, we consider that the networks in which some data objects are instantiated do have a tangible, albeit highly distributed existence. However, we do not consider that these type of data objects are treated as tangible in the normal sense.

395 See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 7: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

396 To the extent that it could also satisfy our other criteria, which we consider is unlikely. We do not intend to include such things within our third category.

397 For example, we think that there is a possibility that data used in Layer 2 crypto-token systems that utilise advanced cryptographic technology such as Zk-SNARKs (see Chapter 11 para 11.96) might not necessarily be "retrievable". We are interested in whether our broader concept of "data represented in an electronic medium" has the same problem or whether it is wide enough to apply to such technology. For example, could some unknown but provable data be said to be "represented in an electronic medium" even if it not capable of being retrieved?

398 We discuss the concept of instantiation in more detail in Chapter 10.

399 In Chapter 10 we discuss how, in addition to pure information and mathematics, crypto-tokens rely on a combination of things to create characteristics that make them function like objects. This includes their

recognise that it is the combination of specific data and the operation of socio-technical networks or systems that allows some digital assets to take on characteristics or attributes that make them function much more like objects than mere records, or pure information or data. In other words, knowledge of the contents of the specific, instance of data alone does not give that data the characteristic of an object of property rights. It only takes on those characteristics by virtue of its specific instantiation within a network or system within which it has been generated. So, it is the combination of this criterion and our other criteria that together, if satisfied, allow a thing to be a data object. This criterion only considers the first part of the issue — that the thing in question must be composed of data represented in an electronic medium. This criterion on its own does not therefore distinguish data objects from information in a broader sense — that distinguishing role is instead performed by our criterion of rivalrousness.

5.19 We consider that focusing on data with an informational quality that is represented in an electronic medium is also consistent with the traditional property law requirement that a thing must have some form of definable or identifiable existence (explicit in the *Ainsworth* criteria).[400] The courts have already found that the criteria of definability and identifiability are met by the existence of a discrete instance of data. See, for example, our discussion of *Armstrong v Winnington*[401] and *Tucows.com Co v Lojas Renner SA*[402] in Chapter 2. So we think it is important to acknowledge that the characteristics of data objects that make them appropriate objects of property rights are necessarily grounded in identifiable or definable data (which has informational qualities). We discuss in detail how such data objects can take on the quality of rivalrousness (and so be distinguished from pure information) at paragraph 5.48 below and in detail in the context of crypto-tokens in Chapter 10.

Our proposal

5.20 We therefore provisionally propose that, to fall within our proposed third category, the thing in question must be composed of data represented in an electronic medium, including in the form of computer code, electronic, digital or analogue signals.

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respective protocol rules, real physical infrastructure, the work of humans and/or machines, energy expenditure, network effects, liquidity, and integration in existing social, economic, or financial infrastructure.

400 We discuss the *Ainsworth* criteria in more detail in Chapter 2 from para 2.37 onwards. These criteria have already been applied to digital assets in the course of evaluating their status as objects of property: see *AA v Persons Unknown* [2019] EWHC 3556 at [59] (applying the criteria to "a cryptoasset such as Bitcoin") and *Ruscoe v Cryptopia Limited (in liquidation)* [2020] NZHC 728 at [102] to [121] (applying the criteria to "cryptocurrencies").

401 *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10, [2013] Ch 156.

402 *Tucows.com Co v Lojas Renner SA* [2011] ONCA 548, 106 OR (3d) 561.

Consultation Question 2.

5.21 We provisionally propose that, to fall within our proposed third category of personal property, the thing in question must be composed of data represented in an electronic medium, including in the form of computer code, electronic, digital or analogue signals. Do you agree?

SECOND CRITERION: INDEPENDENT EXISTENCE

Overview

5.22 The second characteristic that we think a thing must exhibit for it to be capable of falling within our proposed third category of personal property is that it must exist independently of persons and exist independently of the legal system. Broadly speaking, this means that it must exist "there in the world".[403] This criterion excludes from the distinct third category of personal property things which do not exist separately from any particular person (examples include personalities and unsevered body parts), and creatures of law (such as things in action as narrowly defined or statutorily-reified things).[404] If its existence is dependent on either or both of these, then that thing will not satisfy the criteria of our third category of personal property.

5.23 This criterion has two elements:

(1) that a thing must have an existence independent of persons; and

(2) that a thing must have an existence independent of the legal system.

5.24 The first element is intended to ensure that the third category of personal property admits only those things that are properly identified as distinct objects, existing independently from any particular person. This requirement is implicit in Lord Wilberforce's *Ainsworth* criteria, and accords with the related notions of separability and exigibility.[405]

5.25 The second element aims to prevent things in action from satisfying the criteria for the third category of personal property, even if a particular right has become so readily assignable that it is treated, in effect, as if it were an independently existing object.

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403 J Penner, *The Idea of Property in Law* (1997) p 113.

404 Given that our consultation paper relates to the law of England and Wales, we refer to the law of England and Wales for the purposes of this criterion. However, we acknowledge that other jurisdictions might implement statutory rules which recognise the existence of data objects. This should not, without more, prevent those data objects from being capable of satisfying this indicator.

405 These criteria are discussed in Chapter 2 from para 2.37 onwards. Exigibility is the idea that a property right must be grounded in a thing, see M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-007. We discuss the concept of separability in detail in Chapter 2 paras 2.74 to 2.78.

5.26 Although this criterion contains two distinct elements, there might be a degree of overlap between them. That is, some things will fall at this hurdle because they do not exist independently of persons nor do they exist independently of the legal system.

5.27 We consider each element in turn.

Existence independent of persons

5.28 If property law helps to define relationships between objects and persons, then the former must be distinct and separable from the latter. In Professor Penner's words:[406]

> If a relationship is a property relationship, there must be an owner and there must be something owned, and these two cannot be the same things. Furthermore, if one stands in the relationship of owner to a thing, then it must be possible for someone else to own it as well.

5.29 Similarly, an existence independent of persons encapsulates the notion of separability. This means that an object of property rights must be separable from any particular owner.[407] As Michels and Professor Millard explain, "[t]o qualify as an object of property, a thing must be considered distinct from any person who might hold it".[408] If something is necessarily connected to someone, like a friendship, then that thing is not an appropriate object of property rights.

5.30 It is therefore an inherent characteristic of objects of property that they exist independently of persons. It is this that enables the possibility of competing claims to objects, which the law then helps to settle by applying rules that determine who is entitled to what. In *OBG Ltd v Allan*, Baroness Hale suggested that:[409]

> The essential feature of property is that it has an existence independent of a particular person: it can be bought and sold, given and received, bequeathed and inherited, pledged or seized to secure debts, acquired (in the olden days) by a husband on marrying its owner.

5.31 She went on to observe that:

> There are many debts and some other obligations which can now be readily assigned, attached, form part of an insolvent estate, and enjoy all the other characteristics of property ….

5.32 Baroness Hale made these comments in the context of distinguishing things that are separable from persons from things that cannot attract property rights.[410] We do not

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406 J Penner, *The Idea of Property in Law* (1997) p 124.

407 "An owner is not necessarily connected to, but is separable from, the things he holds as property": J Penner, *The Idea of Property in Law* (1997) p 121.

408 J D Michels, C Millard, "The New Things: Property Rights in Digital Files" [2022] *The Cambridge Law Journal* 1, 5.

409 [2007] UKHL 21, [2008] 1 AC 1 at [309].

410 We discuss the concept of separability in more detail in Chapter 2.

however consider that these comments suggest that a debt claim exists independently of the legal system.[411]

5.33 The necessity of an existence independent of persons is also implicit in the *Ainsworth* criteria.[412] To require that an object of property be definable, identifiable, stable, and capable in its nature of being factually transferred to another, is to require it to have an existence independent of any particular person. The concepts of definability, identifiability, and stability speak to the task of specifying the object under consideration. The concept of transferability requires the object to be capable of separation from its owner; in other words, it must be capable of existing independently of that owner. It is the fact that such objects do exist independently — and can therefore be acquired, given, taken, and abandoned[413] — that, at least in part, justifies the law's recognition of them as appropriate objects of property rights.

5.34 Additionally, because property rights are rights in relation to things as opposed to rights in relation to particular persons, the existence independent of persons criterion focuses the enquiry on a thing to which property rights can relate.[414] The criterion therefore also captures an important insight concerning the assertability of property rights. Personal rights and property rights can be distinguished on the basis of those against whom they can be asserted. A personal right can be asserted only against the person to whom it relates, whereas a property right can be asserted against persons generally.[415] This is because property rights do not relate to particular people, but to things.

Existence independent of the legal system

5.35 The second element of this criterion is that, to fall within the third category of personal property, the thing must exist independently of the legal system. As a matter of principle, this requirement ensures a clear divide between a distinct, third category of personal property, and the existing category of things in action. As we discuss in

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411 Even if Baroness Hale did mean to suggest that debt claims exist independently of persons in the latter sense, our view is that this type of right does not exist independently of the legal system.

412 We discuss the *Ainsworth* criteria in more detail in Chapter 2 at para 2.37. These criteria have already been applied to digital assets in the course of evaluating their status as objects of property: see *AA v Persons Unknown* [2019] EWHC 3556, [2020] 4 WLR 35 at [59] (applying the criteria to "a cryptoasset such as Bitcoin") and *Ruscoe v Cryptopia Limited (in liquidation)* [2020] NZHC 728 at [102] to [121] (applying the criteria to "cryptocurrencies").

413 When we speak of an object as capable of being acquired, given, taken, and abandoned, we mean that these dealings with the object are possible as a matter of fact, rather than as a matter of law. For the purposes of identifying suitable objects of property rights, what is required is factual alienability. That is a separate matter from whether the law recognises any such dealing as, for example, a valid transfer of legal title.

414 "Rights are all incorporeal. Those whose exigibility or demandability is defined by the existence and location of the thing to which they relate are rights *in rem*. *Res* is the Latin for 'thing' and right *in rem* means 'right in the thing', or 'to the thing' … Rights *in personam*, by contrast, are rights exigible only against the person against whom they originally arise or someone who is understood to represent that person. Rights *in personam* depend on a person for their exigibility": A Pretto-Sakmann, *Boundaries of Personal Property: Shares and Sub-Shares* (2005) p 90.

415 This point can be explained in another way. With a personal right, there is only one person who owes the right-holder the relevant duty. With a property right, everyone is under a duty not to interfere with the rights of the right-holder.

Chapter 4, the boundary of this latter category has become increasingly permeable, with things in action being taken as "the residue after things in possession have been subtracted".[416]

5.36 Therefore, we intend that this requirement excludes from our proposed third category of personal property things in action, such as debt claims, even where those things are represented in digital form or by data.[417] Those things can only be "asserted by taking legal action or proceedings"[418] — they are "recoverable only by [legal] action".[419] They are therefore wholly reliant on the legal system for their continued existence and enforceability. To adopt Professor Cutts' description, this element of the first criterion specifically excludes "creatures of law".[420] As Adam Sanitt argues:[421]

> The fundamental distinction is not between tangible and intangible objects, but between objects that have a purely legal existence and those that have an existence independent of the law. The dividing line is not physical/non-physical, it is legal/nonlegal.

5.37 Equally, we consider that this criterion prevents statutorily created objects of property rights, such as intellectual property rights, from falling within our proposed third category.[422]

5.38 A data object will be a "non-personal thing"[423] that is capable of existing independently from anyone who may lay claim to it, and independently from any legal system that may be turned to for enforcement of rights in relation to it.[424] A data object cannot be a thing which is reliant on the legal system for its existence.

Our proposal

5.39 Suitable objects of property rights exhibit certain characteristics. These include those described by the *Ainsworth* criteria — definability, identifiability, transferability, and stability — as well as the notions of separability and exigibility. We consider that, to fall

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416 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 4-006.

417 "Contractual rights … do not appear to have the quality of 'thing-relatedness', meaning that they do not relate to anything which 'pre-exists' the legal system": S Douglas, "The Scope of Conversion: Property and Contract" (2011) 74 *Modern Law Review* 329, 341.

418 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 4-002.

419 See R Goode, "What is property?" (2022) *Law Quarterly Review* (forthcoming).

420 T Cutts, "Possessable Digital Assets: Response to the Electronic Trade Documents Law Commission Consultation Paper No 254 and Call for Evidence on Digital Assets 2021" (2021) LSE Law Policy Briefing Paper no.47 p 3.

421 A Sanitt "What sort of property is a cryptoasset?"(2021) *Journal of International Banking and Financial Law* 83 (reproduced at https://www.nortonrosefulbright.com/en/knowledge/publications/26ade77a/what-sort-of-property-is-a-cryptoasset). This argument is made to help properly distinguish things in possession from things in action as a prior logical step before categorising crypto-tokens within a distinct, third category.

422 See Chapter 3 for further consideration of intellectual property rights in this context.

423 H Smith, "The Thing about Exclusion" (2014) 3 *Brigham-Kanner Property Rights Conference Journal* 95, 118.

424 The independent existence criterion was described in similar language at para 5.51 of Digital assets: electronic trade documents (2021) Law Commission Consultation Paper No 254.

within a distinct, third category of personal property, a thing must exhibit those properties, and must also be distinguishable from things in action (narrowly defined).

5.40 We therefore provisionally propose that, to fall within our proposed third category of personal property, the thing must exist independently of persons and exist independently of the legal system.

Consultation Question 3.

5.41 We provisionally propose that, to fall within our proposed third category of personal property, the thing in question must exist independently of persons and independently of the legal system. Do you agree?

Data objects that are closely associated with particular legal relationships

5.42 There is one matter that requires further explanation. Namely, how this second criterion applies to data objects that represent or embody obligations enforceable by legal rights.

5.43 Several respondents to our call for evidence noted that it may be difficult to apply this second criterion to data objects that are closely associated with particular legal relationships. The Cloud Legal Project, for example, said that it was "unclear how the requirement that a [data] object exist 'independently of the legal system' will apply to data objects that embody or represent a legal right". They illustrated their concern with a reference to European emissions allowances, noting that "the register entries are associated with a *legal right* to emit an amount of CO2 under the [EU Emissions Trading System] legislation", and that "the carbon credits, the associated rights, and the registry system were created by legislation".[425]

5.44 A similar point was made by Professor Cutts, who suggested that a requirement for an existence independent of persons and independent of the legal system could function in one of two ways. On the one hand, it could "[operate] negatively (knocking out debts and other legal relationships, even if there is some distinct non-legal data associated with them)". On this approach, and to connect Professor Cutts' point to the Cloud Legal Project's observations, a carbon credit allowance would fail to satisfy the criterion because it represents a legal right, even though there is some distinct non-legal data associated with it. On the other hand, Professor Cutts said the criterion could be interpreted "as a positive requirement for distinct data that does not exclude legal rights". This would be "data that can be processed by a computer" and that "can survive a transfer of the asset that it constitutes or at which it points".[426]

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425 J D Michels, C Millard, and C Reed, on behalf of the Cloud Legal Project, "Response to Law Commission, 'Digital Assets – Call for Evidence'" (2021) p 7. We apply our criteria to Carbon Emissions Allowances and Voluntary Carbon Credits in Chapter 9.

426 T Cutts, "Possessable Digital Assets: Response to the Electronic Trade Documents Law Commission Consultation Paper No 254 and Call for Evidence on Digital Assets 2021" (2021) LSE Law Policy Briefing Paper no.47 p 4.

5.45 We think that the solution to these difficulties, and to analogous difficulties for other types of data object (such as crypto-tokens linked to equity or debt securities), lies in a clear conceptual separation between:

(1) a data object itself; and

(2) any legal relationship to which the data object is (or is purported to be) linked or connected.

5.46 The second criterion requires an object that exists independently of persons and independently of the legal system. It is worth emphasising that for data objects, it is the data object itself — and not any associated legal relationship — that falls to be evaluated against the independent existence criterion. This criterion can be met by a data object itself, regardless of whether that data object is linked to or connected with other things, including legal rights.

5.47 We recognise however that a data object might be used either to represent or record something external to the data object itself or might be linked to something external to the data object or system in which the data object is created/exists. We discuss the different ways in which this might be achieved under the law of England and Wales in Chapter 14 and consider the potential legal consequences of such a link.

THIRD CRITERION: RIVALROUSNESS

Overview

5.48 The third characteristic that a thing must exhibit for it to be capable of falling within our suggested third category of personal property is that it must be rivalrous. Broadly speaking, this means that the thing in question must be something whose capacity for use is not unlimited; people must therefore compete with one another for it. More formally, a resource is rivalrous if use of the resource by one person[427] necessarily prejudices the ability of others to make equivalent use of it at the same time. For example, if Alice uses a Game Boy to play her Pokémon Red game, Bob cannot use the same Game Boy at the same time. Alice's use of the Game Boy prejudices Bob's ability to use it.

5.49 Conversely, a resource is non-rivalrous if its use by one person does not necessarily prejudice the ability of others to make equivalent use of it at the same time. For example, the fact that Alice spends her lunchtime reading the book "Pokémon: The Electric Tale of Pikachu" does not necessarily preclude Bob from reading the same story. Of course, Bob's copy of the book will be a different physical object to Alice's copy, and the physical books themselves will be rivalrous objects. But the story itself — the narrative information recorded in both copies of the book — will be the same. That information is not rivalrous — Alice's consumption of it does not prejudice Bob's ability to consume it.

5.50 Clearly, this prevents pure information from falling within the third category and upholds the law's general reluctance to treat pure information as an object of property

[427] Or a group of persons acting together.

rights.[428] As Professors Low and Wan, and Dr Ying-Chieh, state: "property is rivalrous whereas information is not".[429] This is consistent with our conclusion in Chapter 3 that information is not an appropriate object of property rights. Because information is not rivalrous, it could not fall within our third category of personal property, even where it is represented in digital or electronic form.

5.51 As we explain in Chapter 2, rivalrousness is an important feature of things that are appropriate objects of property rights.[430] One of property law's principal functions is to allocate rivalrous objects between persons, and to protect their liberty to use those objects free from the interference of others. In a world without property law, a person's liberty to make use of a rivalrous resource would effectively depend in large part upon the extent to which they could physically keep others away from it. Few would be secure in their objects of property rights, and security would likely come at the cost of use. As Professor Fairfield notes:[431]

> Locks and safes exist, but they weaken a key feature of property, which is the ability to use the goods openly without having someone take them.

5.52 One advantage of property law, however, is that while physical barriers tend to inhibit use of an object, legal barriers tend to promote it. In other words, the law provides a mechanism for excluding others from rivalrous resources that promotes rather than inhibits use. Such a mechanism, and the protection it confers, is not necessarily required for non-rivalrous resources, because people do not need to compete for use of them.[432]

5.53 It follows that property law is concerned with resources that are rivalrous. More specifically, the criterion of rivalrousness, as a necessary characteristic of objects of property rights, can be derived from the core property law notion of the ability to exclude others from rivalrous resources.[433]

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428 We discuss the law's reluctance to treat information as the subject of matter of property rights in Chapter 3.

429 K Low, W Yee, W Ying-Chieh, "The Future of Machines: Property and Personhood" in P Morgan, E Lim, *The Cambridge Handbook of Private Law and Artificial Intelligence* (forthcoming) p 19.

430 See para 2.62 onwards.

431 J Fairfield, "Bitproperty" (2015) 88 *Southern California Law Review* 805, 861.

432 There may, however, be other justifications for conferring on particular persons the legal right to control particular ideas, signs, or expressions of information, or confidential information, notwithstanding the non-rivalrous nature of information. As we discuss in Chapter 3, these justifications underpin the intellectual property law of patents, trademarks, copyright, and trade secrets, and the law of confidentiality. For further discussion, see L Bently, B Sherman, D Gangjee, and P Johnson, *Intellectual Property Law* (5th ed 2018) pp 4 to 6, 39 to 44, 397 to 399, and 853 to 858; R Merges, *Justifying Intellectual Property* (2011); and C Phipps, W Harman and S Teasdale, *Toulson & Phipps on Confidentiality* (4th ed 2020) ch 2 (Principles and Foundations).

433 "Rivalrousness of consumption ('rivalry') is a function of capacity and the degree to which one's consumption of a resource affects the potential of the resource to meet the demands of others": B Frischmann, "An Economic Theory of Infrastructure and Commons Management" (2005) *Minnesota Law Review* 917, 945 to 946.

Excludability

5.54 As we discuss in Chapter 2, the notion of excludability — that access to an object can be controlled and therefore limited — is also central to the law of property.[434] In Professor Gray's words:[435]

> The primordial principle … is that a resource can be propertised only if it is … 'excludable'. A resource is 'excludable' only if it is feasible for a legal person to exercise control over the access of strangers to the various benefits inherent in the resource.

5.55 If an important element of property is control over access, then objects should not fall within a third category of personal property if it is unfeasible to exercise control over access to them.[436] Resources that are practically open to all, such as sunlight or rainfall, are not readily capable of having access to them determined by any particular person. The point is explained well by Professor Fox:[437]

> As a minimum, any resource that is made the object of property lends itself to protection against unauthorized interference or use by others. *It is a kind of resource from which it is practically possible to exclude others*. A resource that is practically open to all takers or users may never be a suitable or at least an easy candidate for exclusive appropriation to one person through a regime of property rights. (emphasis added)

Rivalrousness and excludability

5.56 The concepts of rivalrousness and excludability are often intertwined. Sometimes, the concepts of rivalrousness and excludability are instead described or defined by a concept of (exclusive) control. For example, both the UNIDROIT Digital Assets and Private Law Working Group[438] and the Uniform Law Commission's ("ULC") Uniform Commercial Code and Emerging Technologies Committee[439] define the term digital asset as an electronic record which is capable of being subject to control.

5.57 But the definition of control used by both the UNIDROIT Working Group and the ULC Committee is highly nuanced and contains many elements comprised in our concept

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434 From para 2.70 onwards.

435 K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal* 251, 268. Note that Professor Gray uses the term "regulatory control". We removed the word "regulatory" in this quotation because of its connotations with prescriptive law.

436 K Gray, "Property in Thin Air" (1991) 50 *Cambridge Law Journal* 251, 294.

437 D Fox, "Cryptocurrencies in the Common Law of Property", in S Green and D Fox, *Cryptocurrencies in Public and Private Law* (2019) para 6.22.

438 See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 7: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

439 These assets are defined as "controllable electronic records" and include, for example, certain types of virtual currency and nonfungible tokens. See Uniform Law Commission, *Draft - Uniform Commercial Code and Emerging Technologies - 2022 May 16-18 Meeting* p 3: https://www.uniformlaws.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=fa5c6c1b-c612-c453-b39d-8b4e3e8496f3.

of rivalrousness. In particular, the definition of control requires that the digital asset or the relevant protocol or system confers on a person:

(i) the exclusive ability to change the control of the digital asset to another person (a "change of control");

(ii) the exclusive ability to prevent others from obtaining substantially all of the benefit from the digital asset; and

(iii) the ability to obtain substantially all the benefit from the digital asset.

5.58 The combination of limbs (ii) and (iii) comes very close to the description of rivalrousness as "a resource is rivalrous if use of the resource by one person necessarily prejudices the ability of others to make equivalent use of it at the same time".

5.59 Elements of the definition of control used by both the UNIDROIT Working Group and the ULC Committee can be traced to the judgment of the Ninth Circuit Court of Appeals in *Kremen v Cohen*.[440] Judge Kozinski considered whether a domain name was capable of attracting property rights and said:[441]

> Property is a broad concept that includes "every intangible benefit and prerogative susceptible of possession or disposition." We apply a three-part test to determine whether a property right exists: "First, there must be an interest capable of precise definition; second, it must be capable of exclusive possession or control; and third, the putative owner must have established a legitimate claim to exclusivity."

5.60 The *Kremen v Cohen* approach, replicated in part by the UNIDROIT Working Group and the ULC Committee, gets close to defining a concept of rivalrousness by requiring that an object of property rights must be a definable thing that is capable of exclusive possession/control. In contrast, our criterion defines rivalrousness directly.

5.61 We consider that the two approaches are very similar and that, in practice, are likely to lead to functionally similar results. However, we chose to frame our approach by reference to the concept of rivalrousness for the following reasons.

5.62 First, discussion in terms of rivalrousness tends to concentrate the inquiry directly on the characteristics of the thing itself. Discussion of possession or control instead focusses attention on the use of the thing which is exercised by the person who holds it. Framing the test in terms of rivalrousness is analytically more direct.[442]

5.63 Second, we think that while rivalrous resources are likely to be (factually) excludable,[443] not all excludable resources are rivalrous. Nor are all controllable resources rivalrous. A criterion that required either some level of exclusivity of control

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[440] *Kremen v Cohen*, 337 F.3d 1024 (9th Cir. 2003).

[441] *Kremen v Cohen*, 337 F.3d 1024,1030 (9th Cir. 2003).

[442] As Professor Fox has pointed out to us.

[443] For further consideration on the concept of excludability, see Chapter 2.

or some level of excludability would therefore need some additional element to narrow the scope of objects that satisfy the criterion. This is the function of limbs (ii) and (iii) in the above UNIDROIT Working Group and the ULC Committee's definition of control.[444]

5.64 By way of example, it is conceivable that some pieces of information might be properly classified as excludable (in a limited sense).[445] Consider a secret known only to one person, or a person's subjective preference (such as their favourite colour). The essence of a secret is that access to it is controlled by, and limited to, those who know it. Similarly, whether someone else knows a particular individual's favourite colour seems to be within the control of the individual, who can choose to share that information or not. However, these pieces of information — even if correctly described as excludable — remain non-rivalrous. The fact that Bob learns Alice's secret, or Alice's favourite colour, does not prejudice Alice's knowledge of that secret or that favourite colour.

5.65 So, in general, if an object is rivalrous, it is possible for one person to exclude others from it.[446] In short, we consider that excludability, in general, follows from rivalrousness. However, excludability also involves practical, legal and moral considerations, which we discuss in more detail in Chapter 2 at paragraphs 2.70 to 2.73.

5.66 Third, Professor Fox pointed out to us that there may be differing degrees of simultaneous control or use that can be made of a thing. Even in the case of land — a highly rivalrous object — a person's possession of the land may be subject to another person's right of use, as where a neighbour has an easement conferring a right of way over it. But the land is still rivalrous. This nuance is reasonably easy to recognise where the discussion in framed in terms of rivalrousness. However, it is more complex to express where the discussion is framed in terms of (exclusivity of) control or excludability, because differing degrees of simultaneous control or excludability may exist, which might give rise to definitional difficulties. We think that this point is important for our analysis and recommendations in later chapters. In particular, in the context of certain custody or collateral arrangements we think that the concept of control may require significant refinement or malleability if it is properly to encompass the variety of possible legal relationships.[447] We discuss this in more detail in

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444 In this way, the test of exclusivity of control indirectly determines whether the thing can be treated as rivalrous in nature. For example, if Alice's assertion of exclusive control over a thing necessarily excludes Bob from any *comparable* degree of control, then we might say that the thing is rivalrous in nature. In this example, however, we would be using the practicality of asserting control over a thing, as opposed to directly considering the rivalrous nature of the thing itself.

445 We discuss this point in more detail in Chapter 3.

446 See also T Cutts, "Possessable Digital Assets: Response to the Electronic Trade Documents Law Commission Consultation Paper No 254 and Call for Evidence on Digital Assets 2021" (2021) LSE Law Policy Briefing Paper no.47 p 4: "the notion of 'rivalry' … is the notion that an asset can be controlled exclusively". We consider that rivalrousness, as opposed to the ability to exclusively control an asset, is the more appropriate test.

447 The concept of control might also require significant refinement or malleability if it is to properly apply to certain Layer 2 implementations of crypto-tokens (for example, state-channel balances).

Chapters 12 and 13 in relation to transfers, Chapter 16 in relation to custody relationships and Chapter 18 in relation to collateral relationships.

5.67 Accordingly, we think that it is more appropriate for the law to focus on the rivalrous nature of an object, rather than its excludability or susceptibility to (exclusive) control, as an important determinant of whether that object is capable of attracting property rights.

5.68 This recognises that a property right must be grounded in a thing. The factual ability either to exclude or to permit access to that rivalrous thing follows as a fundamental element of the concept of property.

Tangibility as a proxy for rivalrousness

5.69 The distinction between rivalrous and non-rivalrous things has historically mapped well, but not perfectly, onto the distinction between tangible and intangible things. That is, tangible things (such as Game Boys and chairs) are usually rivalrous, and intangible things (such as stories and secrets) are usually non-rivalrous. As we discuss in Chapter 4, this distinction has traditionally been used as a helpful proxy for whether a thing can fall within the category of things in possession — particularly goods.[448]

5.70 The reason for this general correlation is that tangibility (or physicality) serves as an excellent proxy for rivalrousness. Tangible things that exist in the world cannot be in two places at once, and one person's use of a tangible thing is necessarily prejudicial to any use by others. However, although the quality of being rivalrous is generally exhibited by tangible things, it does not necessarily follow from this that it can *only* be exhibited by tangible things. In Professor Fairfield's words:[449]

> Traditional property law has long leveraged the physicality of assets as a proxy for the rivalrousness that buyers and sellers demand in property systems … But, while physicality has been a proxy for necessary rivalrousness, it is only a proxy. What is necessary is that property be rival, not that property be physical.

Our proposal

5.71 We suggest that, instead of focusing on factual concepts of excludability or (exclusivity of) control, it is appropriate for the law of England and Wales to focus on the rivalrous nature of a thing. Rivalrousness is the more important determinant of whether a thing is capable of being the object of property rights because a non-rivalrous resource cannot be uniquely associated with a person who can regulate the access of others to it. The nature of non-rivalrous resources therefore makes them unsuitable objects of property rights.

5.72 We therefore provisionally propose that, to fall within our suggested third category of personal property, the thing must be rivalrous.

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[448] For more detail on this discussion, see Chapter 4, from para 4.79 onwards. See also A Murray, *Information Technology and the Law* (3rd ed 2016) p 12.

[449] J Fairfield, "Bitproperty" (2015) 88 *Southern California Law Review* 805, 839.

Consultation Question 4.

5.73 We provisionally propose that, to fall within our proposed third category of personal property, the thing in question must be rivalrous. Do you agree?

Rivalrousness exists on a spectrum

5.74 There is one element of the criterion of rivalrousness that might need further explanation if it is usefully to be applied to digital assets. That is that the quality of rivalrousness is not absolute; rivalrousness exists on a spectrum.

5.75 The concept of rivalrousness is intuitive at its core, but less familiar at its edges. On the one hand, there is an intuitive sense in which certain things are rivalrous (like Game Boys or chairs) and other things are non-rivalrous (like stories or facts).

5.76 On the other hand, although the rivalrous nature of many resources may be intuitive, such intuition does not necessarily get us closer to a technical definition of the concept that we can apply to every type of resource.

5.77 A useful starting point is the explanation offered by Michels and Professor Millard:[450]

> Economists consider an object *rivalrous* if use by one person inhibits use by others. Conversely, a good is non-rivalrous if use by one person does not limit use by another.

5.78 Similarly, this concept of non-rivalrousness was explained by Lord Justice Arnold, in the recent case of *Thaler v Comptroller General of Patents Trade Marks and Designs*, as "meaning that consumption by one does not preclude simultaneous consumption by others".[451] The archetypal example of a non-rivalrous resource is pure information.

5.79 The key to identifying a rivalrous resource, then, is to look to whether use by one person[452] inhibits, or limits, use by others. Importantly, this does not mean that use by one person must render it impossible for anyone else to use it. Professor Cutts suggests that:[453]

> An asset is not rivalrous because it is *impossible* for multiple persons to use it. It is rivalrous if use by one person necessarily limits use by another.

5.80 Here, the notion of "use" should be interpreted broadly as referring to any form of purposeful dealing with the object through which a person derives some form of

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450 J D Michels and C Millard, "The New Things: Property Rights in Digital Files" (2022) *Cambridge Law Journal* 1, 23.

451 *Thaler v Comptroller General of Patents Trade Marks and Designs* [2021] EWCA Civ 1373 at [133]. The resource in this case was an invention that formed the subject matter of a patent application.

452 Or a group of persons acting together.

453 T Cutts, "Possessable Digital Assets: Response to the Electronic Trade Documents Law Commission Consultation Paper No 254 and Call for Evidence on Digital Assets 2021" (2021) LSE Law Policy Briefing Paper no.47 p 4.

benefit. Rivalrous objects, then, are "useful on account on some benefit that cannot be derived at once by multiple [ie infinite] persons".[454]

5.81 The fact that rivalrousness is ultimately a question of the impact of one person's use on the available opportunities for use by others reveals a fundamentally important point about the concept: that rivalrousness exists on a spectrum — it can be a matter of degree. Although things you can hold in your hand sit clearly at the rivalrous end of the spectrum, and information at the non-rivalrous end, "there are a host of resources in between these two extremes".[455] Consider a lake, which has a large but not infinite capacity for swimmers. Two or three people may be able to swim in a lake unaffected by each other's use in practical terms. But there is a point beyond which the lake simply cannot facilitate any additional swimmers. And a swimmer swimming in a lake necessarily prejudices the use of that part of the lake by another person.

5.82 As a final point, it is worth noting that some authoritative descriptions of non-rivalrousness sometimes illustrate the concept by reference to the notion of "value". In *Lloyd v Google*, for example, Sir Geoffrey Vos suggested that "browser-generated information" may be a "non-rivalrous" asset "because it can theoretically be sold to or used by multiple individuals simultaneously without necessarily reducing its value".[456] Speaking extra-judicially, his Lordship has also described a non-rivalrous asset as one "that can be sold to more than one buyer without losing its intrinsic value".[457]

5.83 This is a helpful way of testing for rivalrousness in the commercial world. However, as we discuss in Chapter 2, we decided against explicitly tying the concept of an object of property rights to the concept of value. This is because we think that value is best described as something that is attributed to objects by persons, rather than being an essential component of an object of property rights. An object need not have any intrinsic or commercial value for it to be capable of attracting property rights.[458]

5.84 Instead, we describe rivalrousness by reference to the effect of one person's use on the capacity of others to make equivalent use of the object at the same time. We therefore prefer to say that an object is non-rivalrous if one person's use does not necessarily prejudice the ability of anyone else to use the same asset at the same time. And that it is from this that it follows that a non-rivalrous object theoretically can be sold to or used by multiple individuals simultaneously.

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454 T Cutts, "Crypto-Property? Response to Public Consultation by the UK Jurisdiction Taskforce of the LawTech Delivery Panel" (2019) LSE Law Policy Briefing Paper no.36 p 2.

455 B Frischmann, "An Economic Theory of Infrastructure and Commons Management" (2005) Minnesota Law Review 917, 951.

456 *Lloyd v Google LLC* [2019] EWCA Civ 1599, [2020] 2 W.L.R. 484 at [68].

457 G Vos, "Future Proofing for Commercial Lawyers in an Unpredictable World" (2019) Annual COMBAR Lecture at [21].

458 See para 2.80.

DIVESTIBILITY AS AN INDICATOR

Overview

5.85 Suitable objects of property rights are, in general, necessarily divested on transfer. This means that, as a matter of fact, a transfer of the object must entail the transferor being deprived of it. In other words, when Alice transfers the thing to Bob, Alice must no longer have the thing. For physical objects, this is inherent in their material nature. For data objects, this normally will be a consequence of their technological design.

5.86 If the mechanics of a thing's (specifically for our purposes, a data object's) transfer result, on a closer inspection, in the thing remaining with the transferor, then such a thing is not divestible. This may be the case, for example, if the thing is properly characterised as pure information recorded on a particular physical medium. In that case, most dealings that are labelled "transfers" in fact result in the transferor retaining both the medium and information, even though the "transferee" may receive a copy of the information.[459] For example, when a Microsoft Word file is sent to someone, the transferor effectively creates a copy of the file which can be consumed or used by the transferee without infringing on the transferor's ability to make concurrent use of the original file.

5.87 Therefore, in many cases involving the transfer (or, more accurately in some cases, the transmission) of digital assets, the transferee might be said to acquire a copy of the digital asset, the creation of which is causally connected to the original digital asset. As the authors of *The Law of Personal Property* explain, this is the case with traditional transfers of files:[460]

> A file "transfer" is actually a two-step process of copying and deletion, whereby deletion actually leaves the information on the original medium until it is overwritten by new data.
>
> When the law of property deals in transfers, the transferee receives the exact same thing that the transferor had, not an exact copy of the thing, much less one that is potentially afflicted with generation loss through the copying process. A transfer in the law of property also immediately deprives the transferor of the thing transferred rather than potentially doing so over time depending on whether new information is written over the "deleted" file.

5.88 This is a clear example of when a transfer of a digital asset does not necessarily divest a transferee of the digital asset.[461] We discuss the application of our criteria to digital files in more detail in Chapter 6.

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459 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-011.

460 Above paras 8-011 and 8-016.

461 In the context of digital assets, this is sometimes referred to as the double-spending problem. Simply put, this is the concern that a digital asset may be transferred from Alice to Bob, yet retained by Alice, who can then also transfer it to Caroline. It is a feature of assets that are not divested on transfer. For example, information can be "double-spent". Alice can tell Bob a joke, and then subsequently tell Caroline the same joke. In contrast, tangible objects cannot be "double-spent". If Alice gives Bob an apple, Alice cannot then subsequently give the same apple to Caroline. We discuss the double-spending problem in more detail in Chapter 10.

5.89 Alternatively, in the case of some digital assets such as crypto-tokens, a transfer of a crypto-token typically involves the replacing, modifying, destroying, cancelling, or eliminating of a pre-transfer crypto-token and the resulting and corresponding causal creation of a new, modified or causally-related crypto-token. We discuss in detail in Chapter 13[462] the arguments for applying normal rules of derivative transfer of title to crypto-tokens, notwithstanding that a new, modified or causally-related crypto-token is created on transfer. Nevertheless, in a transfer of a crypto-token it is clear that the transferor divests themselves of that crypto-token.[463]

5.90 Because of the nuances in the design of some digital assets, and in particular, crypto-tokens, we think that the concept of divestibility is better considered as an important indicative characteristic of data objects, rather than as a separate gateway criterion. We discuss this in more detail in the context of crypto-tokens in Chapter 10 at paragraph 10.115.

5.91 We consider this position to be logically consistent with the way in which the law of England and Wales uses the concept of divestibility or transferability as a characteristic of objects that can attract property rights more generally. As the authors of *The Law of Personal Property* argue, divestibility or transferability is an excellent indicator of a thing that can attract property rights, but it is not a necessary characteristic:[464]

> Transmissibility is a general incident of property rights in English law. Alienability or transferability is the default position. Inalienability is exceptional.

Divestibility as an indicative characteristic of data objects

5.92 In *National Provincial Bank v Ainsworth*, Lord Wilberforce said that suitable objects of property are "capable in [their] nature of assumption by third parties".[465] In Chapter 2, we suggested that the most useful interpretation of this requirement, as a means of identifying suitable objects of property, is that it concerns factual alienability or transferability. Objects that are capable of attracting property rights are those that can, as a matter of fact, be acquired, given, taken, and abandoned. That is a separate matter from whether the law recognises any such action as having particular legal consequences. For example, whether Alice's giving of an object to Bob perfects a valid transfer of legal title is a legal question. So is whether Alice's abandoning of an object in the middle of a field amounts to an abandonment of legal title to that object. But that does not prevent Alice from factually giving an object to Bob or from abandoning her object in the middle of a field.

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462 From paragraph 13.17.

463 At least as a proper object of property rights. As the UK Jurisdiction Taskforce, Legal Statement on cryptoassets and smart contracts ("UKJT Statement") notes at paragraph [45]: "The data representing the "old" [crypto-token] persists in the network, but it ceases to have any value or function because the [crypto-token] is treated by the consensus as spent or cancelled so that any further dealings in it would be rejected. Such data could be treated as pure information at that stage (albeit information that is, by design, necessary for the proper functioning of the network).

464 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-005.

465 [1965] AC 1175, at 1248.

5.93 From this requirement of factual alienability, it follows that if a transferor cannot divest themselves of a resource on transfer, then that resource is, in general, not an appropriate object of property rights. This is not least because, for such resources, it is difficult to answer the fundamental property law question: to whom does this resource belong?

5.94 The importance of divestibility — of being alienated on transfer — in property law can also be found in the work of several commentators. For example, Professors Gullifer and Sarra argue that transferability is one of the "most significant incidents of property".[466] Similarly, Professor Penner argues that:[467]

> To be conceived of as an object of property a thing must first be considered as separable and distinct from any person who might hold it, *and is for this reason rightly regarded as alienable*.

5.95 Additionally, as we discuss in Chapter 2, a number of cases considering the proprietary status of different resources, in England and Wales and abroad, have placed considerable weight on the alienability of the resource in question. For example, in *Attorney-General of Hong Kong v Nai-Keung*, the Privy Council noted the peculiarity of the respondent's argument that, despite being alienable, an export quota was nevertheless not capable of falling within the term "property" for the purposes of Hong Kong theft legislation. The court said that:[468]

> It would be strange indeed if something which is freely bought and sold and which may be the subject of dishonest dealing which deprives the owner of the benefit it confers were not capable of being stolen.

5.96 The concept of divestibility is here implicit in the observation that an export quota could be the subject matter of dealings which deprived the owner of the benefit conferred by having the quota. However, the concept of divestibility has also been the subject of more explicit commentary. In *Henderson v Walker*, for example, the High Court of New Zealand noted that one of the principal reasons why information is not an appropriate object of property rights is because it cannot readily be separated from anyone who knows it.[469]

5.97 In other words, information is not a suitable object of property rights because it is not fully divestible on transfer. We think that this statement is of a more general application: any resource or object that is not fully divested of transfer is, in general, unlikely to fall within our suggested third category of personal property. We think however, that there could be some limited exceptions to this broad rule. In particular, we think that certain crypto-tokens could be structured or designed such that they are

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466 Alongside "exigibility" and "excludability", which are themselves incidents which have formed the conceptual basis for our first and second criterions: see J Sarra and L Gullifer, "Crypto-claimants and bitcoin bankruptcy: Challenges for recognition and realization" (2019) 28 *International Insolvency Review* 233, 243.

467 J Penner, *The Idea of Property in Law* (1997) p 113 (emphasis added). On Professor Penner's view, the alienability of objects of property rights follows from their separability.

468 *Attorney-General of Hong Kong v Nai-Keung* [1987] 1 WLR 1339, 1342.

469 [2019] NZHC 2184, see Thomas J at [263].

not fully divestible on transfer (or transferable at all). We discuss this in more detail in Chapter 10.

A standalone criterion?

5.98 We think there is an argument that divestibility is best regarded not as a standalone criterion, but instead as a likely[470] consequence of the fact that a particular object meets our second and third criteria. That is, if a particular object exists independently of persons and independently of the legal system, and is rivalrous in nature, it seems to follow that that object will, in general, be capable of being divested on transfer. Putting the same point the other way around, if an object is not divested on transfer then this seems to cast doubt on whether it exists independently of a particular person, and/or whether it is truly rivalrous. If it is not fully divested by the transferor because it is not separable from them, then the object lacks an independent existence. If it is not fully divested by the transferor because there is no intrinsic limit on the resource's capacity to be used in the same way by more than one person simultaneously, then the object is non-rivalrous.

5.99 In Professor Penner's opinion, for example, the ability of a resource to be alienated from one person to another is simply a consequence of it not being necessarily connected to any particular person.[471] Similarly, in response to our electronic trade documents call for evidence, Professor Cutts said:[472]

> It is not clear to me that the third characteristic adds anything for the purposes of the electronic trade documents consultation: I can think of no good example of a case in which an electronic trade document could be susceptible to exclusive control [that is, rivalrous], but yet not fully divested on transfer.

5.100 This same point might also be made in the form of a question: is it possible for a thing to have an independent existence, be rivalrous, and yet *not* be capable of being divested on transfer?

5.101 In relation to tangible things, we think that the answer is no. It is an inherent characteristic of a rivalrous tangible object, such as a cup, that when Alice gives it to Bob, Alice no longer has the cup. This is a consequence of the fact that such an object cannot be in two places at once. In the physical world, divestibility cannot be detached sensibly from the characteristics of having an independent existence and rivalrousness.

5.102 However, we think that it may be possible to achieve such an uncoupling in the digital world. We think that it may be possible to create an independently existing, rivalrous digital asset that cannot be transferred as a matter of design (other than by destroying it), so that the issue of divestibility does not arise. There may be very good reasons for treating a particular digital asset as a proper object of property rights but nonetheless

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470 As we suggest in more detail in Chapter 10, there may in future be examples of digital assets that are specifically designed as not divestible on transfer for certain purposes.

471 J Penner, *The Idea of Property in Law* (1997) p 113.

472 T Cutts, "Possessable Digital Assets: Response to the Electronic Trade Documents Law Commission Consultation Paper No 254 and Call for Evidence on Digital Assets 2021" (2021) LSE Law Policy Briefing Paper no.47 p 5.

design it such that it is not possible to divest the digital asset. In this situation, we still think that the digital asset could be part of the third category, or at least that it would not fall outside the third category for want of divestibility. When someone has such a thing, they are still able to exclude others from the use or consumption of the thing. It still exists independently of them and independently of the legal system. Moreover, such a thing can be removed *from* the person, it can be destroyed such that the person no longer has it. In this sense, it is sufficiently divestible for the purposes of determining separateness from persons.

5.103 We discuss some possible examples of this in the crypto-token context in more detail in Chapter 10. Nevertheless, this is not likely to be the case for the majority of digital assets which we think are capable of being data objects.

Our proposal

5.104 We suggest that the characteristic of divestibility is best considered as a likely consequence of the fact that a particular object meets our second and third criteria. Divestibility will remain an important, indicative characteristic of objects that are capable of falling within our suggested third category of personal property, and a helpful conceptual touchstone for market participants and the courts. However, given the nuances and idiosyncrasies in the design of some digital assets, and crypto-tokens in particular, we consider that divestibility is best treated as an indicator of when a thing is likely to be a data object as opposed to a gateway criterion for data objects.

Consultation Question 5.

5.105 We provisionally propose that a data object, in general, must be capable of being divested on transfer. Do you agree? Please give examples, if any, of when this will not be the case.

5.106 We provisionally propose that divestibility should be regarded as an indicator, or general characteristic of data objects, rather than as a gateway criterion. Do you agree?

THE CHARACTERISTICS OF DATA OBJECTS: IMPLEMENTATION

5.107 "Property" refers to a particular human practice, the practice of dealing with things.[473]

5.108 To the extent that persons are now using and dealing with digital assets that exhibit characteristics that make them an appropriate object of property rights, such things should be integrated into the law of personal property. They are, in our preferred terminology, data objects that are perfectly capable of attracting property rights.

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[473] J Penner, *The Idea of Property in Law* (1997) p 105. See also the observation that "property rights are rights against persons but in relation to things" in S Douglas, *Liability for Wrongful Interferences with Chattels* (2011) p 12.

5.109 As we discuss in greater detail in Chapter 4, we think that this is a principled direction in which the law of England and Wales can, should, and has already begun to develop. It also accords with the practical reality of how judges and market participants think about, talk about, and use these types of digital assets. As Sir Geoffrey Vos, Master of the Rolls, writing extra-judicially, has noted in the context of crypto-tokens:[474]

> The market, nationally and internationally, is treating crypto-tokens with various characteristics as economic assets. Of course, the law can decline to follow the market. But it does so at its peril. …
>
> In general, the law should try to serve the needs of the society it serves. That should include the economy and financial system of that society. Divergences between the law and the market without a sound policy basis are probably best avoided.

5.110 Similarly, Professor Allen suggests that "recognizing incorporeal objects", such as certain types of digital assets, as the subject matter of property rights "would bring the positive law into line with the reality that incorporeal objects are the largest class of objects in financial capitalist economies".[475] The alternative would seem to be an increasing disjunct between an active marketplace for digital assets, and a law that steadfastly refuses to recognise any of them as objects of personal property.

5.111 We conclude that the nuances and idiosyncrasies of digital assets renders analogies with existing types of personal property imperfect. As explained in Chapter 4, we therefore provisionally propose the explicit recognition of a distinct, third category of personal property. We think that our criteria — which identify those digital assets that can be suitable objects of property — can usefully serve to delineate the boundary of this third category.

COMMON LAW DEVELOPMENT OR STATUTORY REFORM?

5.112 We consider that there are two broad methods for achieving the explicit recognition of a distinct, third category of personal property. First, through incremental common law development. Second, through precise and limited technical legislation. We discuss each of these options below. We do not propose a preferred option at this stage. Instead, we ask consultees for their views.

Common law development

5.113 In Chapter 4 at paragraphs 4.39 to 4.47 we demonstrate that the courts of England and Wales have already begun an iterative process of developing a category of personal property that is distinct from both things in possession and things in action. This suggests that explicit recognition of a third category could be achieved through common law development rather than statutory reform.

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474 G Vos, "Cryptoassets as property: how can English law boost the confidence of would-be parties to smart legal contracts?" (2 May 2019) *Joint Northern Chancery Bar Association and University of Liverpool Lecture*, at [50] to [51].

475 J G Allen, "Property in Digital Coins" (2019) *European Property Law Journal* 64, 100.

5.114 Nevertheless, there are three broad problems with relying on the courts to reform the law in the way suggested in this chapter.

(1) Some courts might feel unable to depart from *Colonial Bank v Whinney.*

(2) The facts and arguments before the courts might be limited.

(3) Common law development is likely to be more incremental.

We consider each in turn below.

Courts reluctant to depart from existing law

5.115 First, a court might be reluctant to take what it might consider a "significant departure from existing law".[476] A court might take the view that the explicit recognition of a third category of personal property would either require, or be better served by, the intervention of Parliament. This was the view of Lord Justice Moore-Bick in *Your Response Ltd v Datateam Business Media Ltd.* In his judgment, he clearly stated that the decision of Lord Justice Fry in *Colonial Bank v Whinney* "makes it very difficult to accept that the common law recognises the existence of intangible property other than choses in action".[477]

5.116 Indeed, there is a clear argument that Lord Justice Fry's statement in *Colonial Bank* limits the scope of what kind of things can attract property rights in law. Taken literally and on its face, Lord Justice Fry's statement does seem expressly to preclude the possibility of an undefined third category outside things in possession and things in action.[478] This reasoning found support from Lord Justice Slesser in *Allgemeine Versicherungs-Gesellschaft Helvetia v Administrator of German Property*,[479] in which he referred to *Colonial Bank* as showing "how the two conditions of [things] in action and [things] in possession are antithetical and how there is no middle term".[480]

5.117 However, we agree with the suggestion of the UKJT Statement that Lord Justice Fry was considering the question of statutory interpretation before him and not the scope of property generally.[481] Similarly, on appeal, the House of Lords did not address the issue of exhaustive classification between things in possession and things in action, and said nothing about the definition of property.[482]

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476 As we discuss at para 5.123, this was Lord Justice Moore-Bick's concern with extending the concept of possession to a broad category of intangible things including the database in question in *Your Response Ltd v Datateam Business Media Ltd* [2014] EWCA Civ 281, [2014] 3 WLR 887 at [27].

477 *Your Response Ltd v Datateam Business Media Ltd* [2014] EWCA Civ 281, [2014] 3 WLR 887 at [26].

478 Fry LJ explicitly said "The law knows no tertium quid [third thing] between the two [categories of things in possession and things in action]": *Colonial Bank v Whinney* (1885) 30 Ch D 261 at 285; *Your Response Ltd v Datateam Business Media Ltd* [2014] EWCA Civ 281, [2014] 3 WLR 887 at [26].

479 [1931] 1 KB 672.

480 *Allgemeine Versicherungs-Gesellschaft Helvetia v Administrator of German Property* [1931] 1 KB 672 at 704.

481 UKJT Statement para 74.

482 UKJT Statement para 76.

5.118 Professor David Fox notes that the authority for Lord Justice Fry's statement was drawn from Sir William Blackstone's *Commentaries on the Laws of England*.[483] Fox suggests that Blackstone's argument:[484]

> had more to do with the nature and enforcement of property in tangible objects than the larger categorization of things in which property might exist.
>
> Blackstone did not say that no third category of personal property existed. He did not turn to the question whether property did (or could) exist in things without any tangible foundation at all.

5.119 For those reasons, we do not think there is clear legal authority that would prevent the law of England and Wales from recognising a distinct, well-defined third category of personal property even without statutory intervention. However, we recognise the concern of Lord Justice Moore-Bick in *Your Response v Datateam.* Lord Justice Moore-Bick was particularly concerned with the potential consequences of common law judicial development that would open an indeterminate third category of personal property to the concept of possession and its legal consequences.[485] This, he suggested, would be a "significant departure from existing law".[486] In other words, it was the application of the concept of possession to a wide, undefined category of intangibles that Lord Justice Moore-Bick felt unable to extend, and not necessarily the categories of personal property.[487] As we discuss at paragraph 5.123 below, Lord Justice Moore-Bick was clearly reluctant to implement such a development through common law.[488]

5.120 For the reasons we set out in Chapter 4 and Chapter 11, we do not suggest that objects falling within our proposed third category should be capable of being "possessed". Instead, we suggest that a third category of personal property would allow the law to develop by analogy with legal principles applicable variously to things in possession or to things in action, but without being fettered by either. In this chapter we proposed detailed criteria for those objects capable of falling within our proposed third category, which will avoid the third category becoming an indeterminate or undefined category. In Chapter 11, we explain why we think that a new concept of control is more appropriate for those things that fall within our proposed third category than the existing common law concept of possession. In this way, our law reform

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483 The two, long-standing categories of personal property were described by Sir William Blackstone in the following way: "Property in [things] personal may be either in possession; which is where a man ha[s] not only the right to enjoy, but ha[s] the actual enjoyment of, the thing; or else it is in action; where a man ha[s] only a bare right, without any occupation or enjoyment". Sir William Blackstone, *Commentaries on the Laws of England* (1765-1769) vol 2 p 389, referenced in D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox, S Green, *Cryptocurrencies in Public and Private Law* (2019) paras 6.34 to 6.37.

484 D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox, S Green, *Cryptocurrencies in Public and Private Law* (2019) paras 6.34 to 6.37.

485 [2014] EWCA Civ 281, [2014] 3 WLR 887 at 896 to 897.

486 Above at 896.

487 Moore-Bick LJ left the question open by acknowledging the possibility that the common law could recognise the existence of intangible property other than things in action, by his use of the phrase "even if it does": [2014] EWCA Civ 281 [2014], 3 WLR 887 at 896.

488 [2014] EWCA Civ 281, [2014] 3 WLR 887 at 896.

proposals recognise Lord Justice Moore-Bick's concerns with extending the concept of possession to a third, indeterminate category of personal property. At the same time, our proposals still aim to achieve what he referred to as "the beneficial effect of extending the protection of property rights in a way that would take account of recent technological developments".[489] Indeed, in *Your Response*, Lord Justice Moore-Bick explicitly acknowledged the "powerful case for reconsidering the dichotomy between [things] in possession and [things] in action and recognising a third category of intangible property".[490]

5.121 For all of those reasons, we prefer the reasoning and conclusion of the UKJT Statement that:[491]

> *Colonial Bank* is not to be treated as limiting the scope of what kinds of things can be property in law. If anything, it shows the ability of the common law to stretch traditional definitions and concepts to adapt to new business practices.

5.122 As we discuss in Chapter 4, recent court decisions have already begun this process. However, there is no explicit judicial recognition of a third category as such — just an acknowledgment that certain things can attract property rights despite not neatly falling within either of the two current existing categories. While we think it would be possible for a court to be more explicit, it would be a significant step and, as discussed below, would require the right set of facts to arise.

The facts and argument before the courts might be limited

5.123 Second, a suitable set of facts would need to come before a court, and full argument on the issue would likely be required, before a court felt able explicitly to propose a third category of personal property. In *Your Response Ltd v Datateam Business Media Ltd*, Lord Justice Moore-Bick was constrained by the facts and the arguments of the case before him — which involved a database and an argument that the database could be the object of a possessory lien. Although he was sympathetic to arguments for law reform which would "set the law on a modern footing" in relation to technological developments,[492] we suggest that the facts of the case before the court did not give it the opportunity to do so. Indeed, in this consultation paper we suggest that databases would not fall within our suggested third category of personal property (see Chapter 6). We also argue that possession is not the most appropriate concept to apply to those data objects that do fall within the third category (see Chapter 11). Both of these conclusions align with Lord Justice Moore-Bick's judgment. Perhaps in part because he recognised that the perfect set of facts was unlikely to come before the court, Lord Justice Moore-Bick suggested that law reform in this area "may now have to await the intervention of Parliament".[493]

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489 [2014] EWCA Civ 281, [2014] 3 WLR 887 at 896.

490 [2014] EWCA Civ 281, [2014] 3 WLR 887 at 896, referring to the arguments made in S Green, J Randall, *The Tort of Conversion* (2009).

491 The full reasoning of the UKJT on this point is set out at paras 66 to 84. It was cited with approval by Bryan J in *AA v Persons Unknown* [2019] EWHC 3556 (Comm), [2020] 4 WLR 35 at [58].

492 *Your Response v Datateam Business Media Ltd* [2014] EWCA Civ 281, [2015] 1 QB 41 at [27].

493 Above at [27].

5.124 Similarly, *OBG Ltd v Allan* concerned the question of whether a thing in action was capable of possession — a necessary requisite for an action in conversion. Again, the facts of the case before the court made it difficult for the court to make incremental, targeted and technology-specific reform — the things in question in *OBG v Allan* were contractual rights — classic things in action. And both Lord Walker and Baroness Hale suggested that it would be appropriate for any law reform which would extend the application of the concept of possession to intangible things to come from Parliament, after consideration by the Law Commission.[494]

5.125 Although cases such as *Ruscoe v Cryptopia*[495] and *B2C2 ltd v Quoine pte ltd*[496] did involve arguments that certain digital assets, namely crypto-tokens, could not attract personal property rights, that issue is now largely settled. We also consider it unlikely that market participants who are heavily involved in arrangements concerning these new types of thing would argue against their characterisation as capable of attracting property rights. For example, A Ray, Dr Clifford and Dr Roberts suggest that:[497]

> In many of the freezing order cases [involving crypto-tokens,] no argument was advanced against the proposition that [crypto-tokens] could be property. This was likely in part because the respondent parties were themselves [crypto-token] exchanges, and so could face a competitive disadvantage were the assets determined not to be property.

5.126 Perhaps the most likely forum for dispute would be in cases involving insolvency where the characterisation of digital assets, including crypto-tokens, could be important for valuation purposes. The classic example is the case of Mt. Gox where, as we discuss at paragraph 4.58, the determination as to the status of BTC as property was highly relevant for the potential return to creditors of the bankruptcy estate.[498]

5.127 Another possible example is that a person might conclude a transaction of sale with a counterparty on terms that payment will be made in crypto-tokens. If the counterparty becomes insolvent before the execution of the contract, then a question will arise as to the proper characterisation of the crypto-tokens for the purposes of the creditors' claim.[499]

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494 *OBG Ltd v Allan* [2007] UKHL 21, [2008] 1 AC 1 at [271] by Lord Walker and at [316] to [317] by Baroness Hale.

495 [2020] NZHC 728, [2020] 22 ITELR 925.

496 [2020] SGCA(I) 02 (Singapore Court of Appeal).

497 A Ray, D Clifford, H Roberts, "The rise and rise again of digital assets – reconceptualising data as property" *Modern Studies in Property Law Conference 2022.*

498 At the date of the Mt. Gox bankruptcy in 2014, the BTC price in US$ was about US$483. But on 1 April 2022, the BTC/US$ rate closed at US$46,270, see https://www.coingecko.com/en/coins/bitcoin/historical_data/usd#panel. Whether creditors had a proprietary claim to BTC, or whether their claim was to be converted to Japanese Yen as at the onset of bankruptcy proceedings was therefore important. See also para 4.58 above.

499 This example was given by Zacaroli J in a lecture delivered to the Insolvency Lawyers Association on 17 October 2019, reproduced in *South Square Digest* (November 2019) at https://southsquare.com/wp-

5.128 The arguments in any such case are likely to be complex and highly fact-specific. Even if such a dispute did arise, there is no certainty that the facts of the case would either require or allow the court to redevelop the existing categories of personal property. And it is likely that any sufficiently contentious case would be appealed, which would delay any resolution of the issue in the short-term.

5.129 More generally, litigation, by its nature, brings up only isolated (albeit important) issues at a time. So there is not always an opportunity for the courts to consider law reform of the whole legal landscape together at once in a holistic way. This reduces the ability for a single court to unilaterally engage in a law reform process that ensures that the law in its entirety is changed in a way which will best accommodate new things while maintaining law that works very well for conventional things.

Common law development is likely to be more incremental

5.130 Third, developing general principles applicable to a third category of personal property would be a significant undertaking for a single judgment. A court might feel that incremental development of the kind seen to date would be more appropriate.

5.131 Given the iterative nature of common law development, it is perhaps not surprising that judges have been cautious about making a significant conceptual change in a single case, even though such a change might be justifiable on legal and policy grounds. For these reasons, we consider that common law development is unlikely to explicitly create a third category of personal property in the short term. This is not necessarily a disadvantage of the common law. Indeed, careful and iterative legal development is characteristic of the law of England and Wales. On the other hand, an iterative process may mean that the position remains uncertain for some time, potentially leaving the market with less certainty for a prolonged period.

Statutory reform

5.132 An alternative to iterative common law development is statutory reform.

5.133 The role of statutory intervention would be to confirm that something which has the legally relevant features of an object of personal property rights is not itself prevented from attracting those rights simply because it does not squarely fit within existing categories. The statute could set out the criteria described in this chapter and explicitly recognise that a thing that exhibited those features would fall within a distinct category of personal property. Other law reform that we propose in this paper could also potentially be included.[500] We recognise that to reduce our proposed criteria, even in outline, to statutory language would be a significant challenge due to the highly nuanced concepts involved. We saw the beginnings of this challenge in the drafting of

content/uploads/2019/11/Digest-Nov-2019.pdf. We discuss these questions in more detail in Chapter 19, and provisionally conclude that the better view is that an action to enforce an obligation to "pay" non-monetary units such as crypto-tokens is best conceptualised as a claim for unliquidated damages for failure to deliver a commodity rather than as a monetary debt. We ask respondents for their view on this in Chapter 19.

[500] Examples include the express recognition that the factual concept of control (as opposed to possession) applied to data objects (see Chapter 11) and the introduction of an "innocent acquirer rule" in respect of crypto-tokens (see Chapter 13).

our Electronic Trade Documents Bill.[501] However, to provide in legislation for a third category of personal property without setting parameters for what falls within that category may not provide the necessary certainty for the market or sufficient guidance for judges.

5.134 Legislation would give the courts legal certainty that it is possible to recognise new objects of property that do not fall within either the category of things in possession or the category of things in action. The responses to our call for evidence on digital assets included support for this type of approach. For example, the Association for Financial Markets in Europe also suggested that the statutory recognition of a third category of personal property would be a useful development:

> [In relation to] decentralised digital tokens that are neither liabilities of any individual or institution nor backed by any authority (e.g. Bitcoin, Ethereum), […] we consider that more novel statutory intervention is necessary to provide market participants with complete confidence that English law recognises such assets as part of a broader class of intangible property, which are neither a thing in possession nor a thing in action (in the narrow sense of the term as a right of property that can be enforced by court litigation or action). The market plainly attributes extrinsic value to such assets and treats them as property.

5.135 Nevertheless, we recognise that "reforming the common law by statute is not an easy task", and the difficulties of statutory law reform in a constantly developing area.[502] In particular, we recognise that it would be wholly impractical to attempt to target any specific digital asset, or sub-set thereof in legislation. This is in part because creating a definition that is both accurate and future-proof would be extremely challenging. In addition, it is not necessarily true that statutory intervention would be faster than iterative common law developments. Similarly, legislation would, in any case, require interpretation and implementation by the courts and therefore might not be a panacea in terms of legal certainty for market participants.

Further, iterative development

5.136 In this consultation paper, we ask consultees whether the explicit recognition of the existence of a distinct third category of personal property and the criteria discussed in this chapter would be best achieved by common law or statutory reform. Regardless of the method of recognition of a third category, we consider that the detailed development and application of those concepts should be left to the common law.

5.137 We consider that this suggestion builds on and remains consistent with the process started by the UKJT Statement. The UKJT Statement included a "detailed and careful" consideration of the legal issues relating to crypto-tokens.[503] It was explicitly referred to by a number of common law courts, including the Singapore Court of Appeal in

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501 See Electronic Trade Documents (2022) Law Com No 405.

502 The difficulties were described by Baroness Hale in *OBG Ltd v Allan* [2007] UKHL 21, [2008] 1 AC 1 at [90].

503 *AA v Persons Unknown* [2019] EWHC 3556 (Comm), [2020] 4 WLR 35 at [57] by Bryan J.

B2C2 ltd v Quoine pte ltd[504] and the New Zealand High Court in *Ruscoe v Cryptopia*.[505] In *AA v Persons Unknown*, Mr Justice Bryan said:[506]

> I consider that [the UKJT Statement's] analysis as to the proprietary status of [crypto-tokens] is compelling and for the reasons identified therein should be adopted by this court.

5.138 The UKJT Statement was written by practising lawyers and was not a binding statement of the law, nor was it formally endorsed by any members of the UKJT in any judicial capacity. Nevertheless, it has proved to be an extremely important development for the law of England and Wales. A number of courts, after detailed consideration, were prepared to adopt the reasoning in the UKJT Statement, effectively treating it persuasive quasi-authority for the views contained in it.[507] In this respect, Ray, Dr Clifford and Dr Roberts suggest that the UKJT Statement provided helpful assistance to the court on difficult questions regarding novel digital things:[508]

> In contrast to the Singapore Court of Appeal [in the case of *B2C2 ltd v Quoine pte ltd*], the UK Court had a clear quasi-legislative statement that it could draw on in support of its ultimate determination that notwithstanding that [crypto-tokens] fell outside the traditional realms of property [they] could be considered some form of property.

5.139 Digital assets will continue to iterate and evolve. That development is likely to outpace prescriptive or proscriptive legislative reform. Instead, we suggest that law reform in this area should seek to preserve the inherent flexibility of the law of England and Wales through a process of targeted statutory intervention (where considered necessary), "quasi-legislative"[509] guidance such as the UKJT Statement, and industry-led guidance. The Chancellor of the Exchequer (in a speech given by John Glen MP) recognised this point explicitly in relation to law reform and regulation:[510]

> Change is going to be dynamic… which means that the way we regulate crypto-technologies needs to be dynamic too. Just as it should be for other financial activities and products. We shouldn't be thinking of regulation as a static, rigid thing. Instead, we should be thinking in terms of regulatory 'code' … like computer code… which we refine and rewrite when we need to… tailored and proportionate, yes… but also nimble and tech-neutral… shaped by [industry] input and advice… and with the

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504 [2020] SGCA(I) 02 (Singapore Court of Appeal) at 144.

505 [2020] NZHC 728, [2020] 22 ITELR 925 at [117] and [124].

506 *AA v Persons Unknown* [2019] EWHC 3556 (Comm), [2020] 4 WLR 35 at [57] by Bryan J. The UKJT Statement was also referred to in *Tulip Trading Ltd v Bitcoin Association for BSV* [2022] EWHC 667 (Ch), [2022] 3 WLUK 379 at [16] by Falk J.

507 Although not binding authority, see *AA v Persons Unknown* [2019] EWHC 3556 (Comm), [2020] 4 WLR 35 at [57] by Bryan J.

508 A Ray, D Clifford, H Roberts, "The rise and rise again of digital assets – reconceptualising data as property" *Modern Studies in Property Law Conference 2022* at [20].

509 Above.

510 See, Keynote Speech by John Glen, Economic Secretary to the Treasury, at the Innovate Finance Global Summit during Fintech Week 2022: https://www.gov.uk/government/speeches/keynote-speech-by-john-glen-economic-secretary-to-the-treasury-at-the-innovate-finance-global-summit.

Treasury and regulators, through the Cryptoassets Taskforce, working together to create a dynamic regulatory landscape which works for everyone.

5.140 This would enable the courts to continue to iterate and innovate on the path carved for them by the UKJT Statement. We also hope that our final report on digital assets,[511] will be a helpful reference point for the courts and Parliament in developing and defining the criteria of the third category of personal property — data objects.

5.141 Overall, we provisionally propose that the law of England and Wales should explicitly recognise a distinct, third category of personal property. However, given the potential significance of this development, we are keen to receive further feedback from market participants on the most authentic and appropriate means of implementing our proposal.

Consultation Question 6.

5.142 We provisionally propose that:

(1) the law of England and Wales should explicitly recognise a distinct third category of personal property; and

(2) a thing should be recognised as falling within our proposed third category of personal property if:

(a) it is composed of data represented in an electronic medium, including in the form of computer code, electronic, digital or analogue signals;

(b) it exists independently of persons and exists independently of the legal system; and

(c) it is rivalrous.

Do you consider that the most authentic and appropriate way of implementing these proposals would be through common law development or statutory reform?

[511] Which will incorporate the feedback and responses from market participants and industry on this consultation paper and the proposals herein.

Chapter 6: Digital files and digital records

INTRODUCTION

6.1 In Chapters 6 to 10 we test various, broadly described, categories of digital assets against the criteria of our proposed third category of personal property — data objects. We provisionally conclude that not all digital assets exhibit the requisite characteristics of data objects. Those that do not exhibit the requisite characteristics will not fall within our proposed, distinct third category of personal property.

6.2 The broadly defined categories of digital assets which we consider are:[512]

(1) digital files and digital records (this Chapter 6);

(2) email accounts and certain in-game digital assets (Chapter 7);

(3) domain names (Chapter 8);

(4) various types of carbon emissions scheme (Chapter 9);[513] and

(5) crypto-tokens (Chapter 10).

6.3 It is important to note that we do not test individual digital assets falling within those broad categories against the criteria. Therefore, it is possible that a particular digital asset might exhibit the requisite characteristics of data objects and so fall within our proposed third category of personal property. This could be the case even if that particular digital asset falls within one of the broad categories that do not generally exhibit the criteria of data objects.

DIGITAL FILES

6.4 For ease of analysis, we consider two broad types of digital file: (1) media files; and (2) program files. This is consistent with the broad division between file types that the authors of *The Law of Personal Property* describe:[514]

> Media files are files that contain information which can be written, audio, visual, or a combination of the foregoing. Program files, on the other hand, are executable digital files consisting of code, [that is] machine language, that can run on

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512 We accept that it is not always possible to characterise a particular digital asset as falling within a particular broad category. However, the broad categories which we consider are based on the categories identified by the authors of *The Law of Personal Property*, who divide the categories of digital assets as follows: "(1) digital files; (2) digital records; (3) domain names; (4) cryptoassets (including cryptocurrencies); and (5) in-game digital assets." See M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-002.

513 We apply our criteria to these schemes to illustrate by way of analogy how our analysis might apply to other similar intangibles, such as waste management licences or milk quotas.

514 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-003.

computers. The latter are often required to read the former, and are themselves also information, albeit machine readable.

6.5 The broad category of media files includes anything from written documents, to pictures and music files (each, in some digital[515] format). In general, this type of digital file is used for the storage and subsequent relaying of informational content on computers. The second broad category covers things like software or computer programs, wherein the file stores a set of instructions for a computer. These instructions are usually written in human-readable[516] source code, and then translated into computer-readable code through a compiler.[517]

MEDIA FILES

6.6 First, we consider media files. Our preliminary view is that, in general, media files do not exhibit the characteristics of data objects that we describe in Chapter 5, and so would not fall within our proposed third category of personal property.

Media files as things

6.7 As we suggest in Chapter 2, an important starting point is to identify a thing, before asking whether that thing can be the object of property rights.

6.8 This is not necessarily an easy task in relation to media files because, in everyday use, we have adapted to using visual and linguistic metaphors[518] to describe media files. This is in part because the designers of graphical user interfaces ("GUIs")[519] often use representative symbols that resemble their real world-counterparts (such as a picture of a file, or a picture of a recycling bin).[520] GUIs intentionally obscure the inner-working of computers and file systems. While this is often helpful for an end-user, it is less helpful for an accurate legal analysis.

What is a media file?

6.9 Media files are, at a high-level, constituted of the following:

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515 For a detailed consideration of the term digital, the distinction between digital and analogue and the relationship between digital and analogue, see M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) paras 8-004 to 8-005. We adopt the term digital for the purposes of this chapter.

516 Although note K Moon, "The Nature of Computer Programs: Tangible? Goods? Personal Property? Intellectual Property?" (2009) 31 *European Intellectual Property Law Review* 396, 397 to 398: "The first instructions to machines were in the form of binary code read and input by humans".

517 A compiler is a program that translates a source program written in some high-level programming language (such as Java) into machine code for some computer architecture (such as the Intel Pentium architecture). See Lambda, "What is a compiler": https://lambda.uta.edu/cse5317/notes/node3.html.

518 See M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) paras 8-011 to 8-013.

519 Graphical user interfaces are computer programs that enable a person to communicate with a computer through the use of symbols, visual metaphors, and pointing devices, instead of text-based command-line interfaces. See "Graphical User Interface": https://www.heavy.ai/technical-glossary/graphical-user-interface.

520 This design concept is referred to as skeuomorphism.

(1) some form of informational content; and

(2) some space on a physical storage medium that is used to record that informational content. The physical storage medium could be a hard drive, or a more portable device such as a Universal Serial Bus ("USB") flash drive.[521]

6.10 The way that informational content is recorded by the physical storage medium is that it is converted into "the basic building block of all digital files … the binary '0's and '1's that together comprise a bit."[522] Depending on the physical storage medium, bits can be represented in different ways. For example, all magnetic storage devices read and write data by using electromagnetism.[523] Optical discs rely on light rather than magnetism to store data.[524] Other physical storage media uses different processes.

6.11 Media files need not necessarily be stored on physical storage media in a continuous sequence of bits:[525]

> While blank computer media is normally written upon sequentially, over time, as files are added and deleted from the medium itself, new files are written in empty segments on the medium even if they are not contiguous. These separate blocks of data are called file extents.

6.12 Because of the way in which media files are stored on physical storage media, a computer system which controls the storage and retrieval of data is needed. This is generally called a "file system". Each group of data, which may or may not be contiguous, is called a "file".[526]

6.13 A "file" is then presented to an end-user through a GUI. The GUI presents the specified group of data — the file — to the end-user on-screen in a structured manner, and (normally) in a way that uses representative symbols such as the "file" icon that looks like a paper file. This happens even though the specified group of data may in fact be scattered across separate places on the hard drive.

Alternative views

6.14 Below, we describe two related but alternate views as to the thing that is a media file and test each view against the criteria of our proposed third category of personal property.

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521 "Computer storage has ranged from paper (in the form of punch cards and punch tapes), to magnetic media such as today's hard disk drive (HDD) and the formerly commonplace removable floppy disks, to optical discs (such as CDs, DVDs, and Blu-ray discs), to the increasingly common solid state drive (SSD) which uses integrated circuit assemblies as a storage medium": M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-006, referring to K Goda and M Kitsuregawa, "The History of Storage Systems" (2012) 100 *Proceedings of the IEEE* 1433.

522 See M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-010. A bit represents a logical state with one of two possible values ('1' or '0').

523 See S Mueller, *Upgrading and Repairing PCs* (22nd ed 2015) ch 8 for a detailed description.

524 See IBM, "Optical storage": https://www.ibm.com/docs/en/i/7.1?topic=solutions-optical-storage.

525 See M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-010.

526 Above para 8-011.

6.15 The first view is straightforward. The authors of *The Law of Personal Property* draw a sharp distinction between the data that comprise a media file and the medium upon which they are recorded:[527]

> Although the process of making a copy may arguably be described as intangible, no copy of a digital file ever exists without a physical, and hence tangible, medium.

6.16 A media file, treated in this way, is therefore two things: informational content, and some space on a physical storage medium that is used to record that informational content. This view treats media files as pure information which is inextricably embedded on the particular physical storage medium. The authors *of The Law of Personal Property* suggest that this "distinction between the data that comprise a digital file and the medium on which it is recorded may now be regarded as settled law".[528]

6.17 Similarly, Harvey suggests that a media file does not exist independently of the technological process that recreates it every time a user opens it on a screen.[529] That technological process is, without more, simply pure informational content which is recorded in some space on a physical storage medium (that is, a media file within the first view which we discuss above).

6.18 In contrast, Michels and Professor Millard put forward a more complex argument that media files are not merely informational content which is recorded on some form of physical storage medium, but virtual objects that differ in relevant ways from the information which they contain.[530]

6.19 They suggest that there are three distinct "layers" which make up a media file:

(1) The first layer they describe is the physical layer. At this level, the media file exists as informational content that is converted to binary form and is then written to, or embedded on, the particular physical storage medium. This is very similar to the analysis described above.

(2) The second layer they describe is the logical layer. The authors acknowledge that a computer system which controls the storage and retrieval of a specified group of data — the file — is needed. As we note above, this is generally called a "file system". However, the authors suggest that, for a file system to work, there must be a discrete file location (each file having its own access path: the

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527 See M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-013.

528 *St Alban's City & District Council v International Computers Ltd* [1996] 4 All ER 481; *Thunder Air Ltd v Hilmarsson* [2008] EWHC 355 (Ch); *Your Response Ltd v Datateam Business Media Ltd* [2014] EWCA Civ 281, [2015] QB 41 at [20]; *Computer Associates UK Ltd v The Software Incubator Ltd* [2018] EWCA Civ 518, [2018] 1 Lloyd's Rep 613. See also, in Australia, *Gammasonics Institute for Medical Research Pty Ltd v Comrad Medical Systems Pty Ltd* [2010] NSWSC 26 and, in Scotland, *Beta Computers (Europe) Ltd v Adobe Systems (Europe) Ltd* [1996] SLT 604.

529 See D Harvey, "Case Note: Digital Property – Dixon v R [2015] NZSC 147" [2017] *New Zealand Criminal Law Review* 678, 691 to 692.

530 J D Michels, C Millard, "The New Things: Property Rights in Digital Files" [2022] *The Cambridge Law Journal* 1, 10 to 11.

devices, directories, subdirectories and the file name) that a file system can identify:[531]

> At the logical layer, a digital file is denoted by a file name. A file name consists of a string of characters generated by software or set by the user. Operating systems typically require the final section of a file name to indicate the type of file, such as .doc, .jpg, or .mp3.

(3) The third layer they describe is the content layer. The content layer exists as the collection of information presented for human sensory perception, generally through the GUI (as discussed above). This would include text, music, or pictures.

6.20 Michels and Professor Millard suggest that a media file should be recognised as a "distinct virtual object that exists at the logical layer of a computer system".[532] In this way, they suggest that such a "distinct virtual object" — a file — exists as "a set of logical instructions…to reflect the file's content in binary code."

6.21 The second layer — the logical layer — is described as "perceptual cyberspace", to differentiate it from the "physical cyberspace" of the first, physical layer which is generally constituted of physical storage media.[533] The argument is that the logical layer is the layer at which people interact with files. Files are treated by users as single, discrete entities despite the fragmented ways in which they may be recorded at the physical layer,[534] and despite the different ways in which they may be displayed at the content layer.

6.22 Below we test the two alternate views against our criteria of our proposed third category of personal property.

APPLICATION OF OUR CRITERIA TO MEDIA FILES ACCORDING TO THE FIRST VIEW

6.23 The first view treats a media file as two things — informational content and some space on a physical storage medium that is used to record that informational content.

Data represented in an electronic medium

6.24 Our first criterion is that the thing in question must be composed of data represented in an electronic medium. As we said in Chapter 5, we expect that, as a general principle, the data in question will be capable of being processed by a computer and may exist in the form of computer code.

6.25 It is difficult to see how this criterion is satisfied under the first view. If one considers the physical storage medium that is used to record that informational content, then that physical storage medium is clearly not composed of data represented in an

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[531] J D Michels, C Millard, "The New Things: Property Rights in Digital Files" [2022] *The Cambridge Law Journal* 1, 10 to 11.

[532] J D Michels, C Millard, "The New Things: Property Rights in Digital Files" [2022] *The Cambridge Law Journal* 1.

[533] Above, 13.

[534] Above, 22 to 23.

electronic medium. It is instead a tangible thing composed of a collection of physical particles or matter within a defined boundary of three-dimensional space. That tangible thing is then used to record informational content (which, at that point, could be said to be definable and identifiable — but only by reference to the physical storage medium on which it is recorded). Only if one considers the media file as represented on some form of GUI (or elsewhere in electronic form) could it be said to be data represented in an electronic medium.

6.26 However, the authors of *The Law of Personal Property* suggest that the media file exists only in the form of informational content which is encoded on a physical storage medium.[535] The representation of the media file on a screen, through the GUI, is described as a "metaphor" which enables the user to understand and to interact with the computer. The computer itself uses file system software to control the storage and retrieval of the data stored as a file. Lord Justice Moore-Bick's statement in *Your Response v Datateam* acknowledges this important point:[536]

> I fully accept that entering information into an electronic data storage system results in an alteration to the physical characteristics of the equipment. It is unnecessary to discuss the details of the processes by which information is stored in, and retrieved from, computers. It is sufficient for present purposes to say that in one way or another (depending on the storage medium) physical changes are brought about in the storage medium which embody the entry of the information and enable it to be recalled. In that sense the process is similar to making a manuscript entry in a ledger: there is a physical change in the condition of the ledger by the application of ink to a sheet of paper. However, that does not in my view render the information itself a physical object capable of possession independently of the medium in which it is held and in the electronic world the distinction is of some importance because of the ease of making and transmitting intangible copies.

Independent existence

Existence independent of persons and existence independent of the legal system

6.27 As we discuss in Chapter 3, it is not easy to describe how pure information has an existence independent of persons. However, information can, and does, exist independently of the legal system. In contrast, physical storage media exist independently of persons and exist independently of the legal system.

6.28 So, it is possible for this criterion to be satisfied when the media file in question is identified as some space on a physical storage medium that is used to record some informational content.

6.29 Similarly, if and to the extent that a media file can properly be described as being data represented in an electronic medium then it would be possible to describe that data as existing independently of persons and independently of the legal system.

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535 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-013.

536 [2014] EWCA Civ 281, [2014] WLR(D) 131 at [19].

Rivalrousness

6.30 In Chapter 3, we explain that pure information is the archetypal non-rivalrous resource. The informational content of a media file would not therefore satisfy this criterion. Physical storage media would satisfy this criterion. The use or consumption of space within physical storage media necessarily prejudices the use or consumption of that space by another. But in this case a media file would only satisfy our criterion of rivalrousness because of the physical attributes of the storage medium on which it is recorded, and not because of the characteristics of the media file itself.

Divestibility

6.31 As we discuss in Chapter 3, information is not a suitable object of property rights because it is not fully divestible on transfer. In contrast, physical storage media are perfectly divestible on transfer. The handing over of a USB stick divests the transferor of factual possession of that USB stick.[537] Nevertheless, it might not be possible physically to transfer a single media file — the totality of the file is restricted to the specific part of the storage medium which records the file. It might not be possible to deal with the file individually in that sense, because that would require a physical transfer of only the specific part of the physical medium which records that specific file. As we discuss above, files can, in fact, be recorded across scattered locations within physical storage media. We also discuss the mechanics of transfers of media files in more detail at paragraph 6.42 onwards, below.

6.32 In summary, on the first view — that media files consist only of pure informational content which is recorded in some space on a physical storage medium — our criteria would not be satisfied. The physical storage medium would not satisfy the first criterion but would satisfy each of the others. That is not a problem for the law — physical storage media fall squarely within the existing category of things in possession. And, as we discuss in Chapter 3, pure information is not an appropriate object of property rights. Informational content recorded on physical storage media only takes on characteristics that would satisfy (some) of our criteria by reference to the medium on which it is recorded. We suggest that this is not enough to justify treating that informational content (as opposed to the physical storage medium) as an appropriate object of property rights.

APPLICATION OF OUR CRITERIA TO MEDIA FILES ACCORDING TO THE SECOND VIEW

6.33 The second view treats a media file as a distinct virtual object that exists at the logical layer of a computer system.

Data represented in an electronic medium

6.34 If a media file can be said to exist as "a set of logical instructions…to reflect the file's content in binary code", then that set of instructions is contained in a discrete specified group of data, or a data structure.[538] The point of these data is that they are capable of being processed by a computer — they are data represented in an electronic medium including in the form of computer code, electronic, digital or analogue signals. That set

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[537] We discuss possession in more detail in Chapter 11.

[538] Each file having its own access path: the devices, directories, subdirectories, and the file name.

of instructions is used at the logical layer to direct file system software to access the informational content of a file, which is stored on some physical storage medium.

6.35 Therefore, our first criterion is satisfied under the second view of a media file as a "set of logical instructions…to reflect the file's content in binary code." But, if the set of instructions is considered together with the physical storage medium on which it is recorded, then the criterion would not be satisfied for the reasons we discuss above.

Independent existence

Existence independent of persons and existence independent of the legal system

6.36 If a media file exists as "a set of logical instructions…to reflect the file's content in binary code" which is represented in an electronic medium then it is possible to describe that media file as existing independently of persons and independently of the legal system. The media file itself can be separated from a person and does not require a person for its continued existence. Similarly, we do not think that the existence of "a set of logical instructions…to reflect the file's content in binary code" requires the legal system for its continued existence.

6.37 By contrast, physical storage media do exist independently from persons, but a reliance on physical storage media would exclude media files from our third category of personal property for other reasons (which we discuss above — namely that their rivalrousness is derived from the physical hardware on which they are recorded).

Rivalrousness

6.38 Michels and Professor Millard suggest that media files are rivalrous in that:[539]

> At the logical layer, digital files can be copied any number of times to different physical carriers, with each copy being of the same quality as the original. Technically, each 'copy' is a distinct digital file with its own file name and storage location. An OS's file management system does not allow two files to exist with the same access path, that is with identical names, in the same folder, on the same device. This means each copy of a digital file is itself a separate virtual object, which can typically only be enjoyed by one person at a time. This makes each digital file rivalrous and differentiates digital files from mere information.

6.39 However, this argument seems to rely not on the rivalrous nature of the media file itself, but instead on the rivalrous nature of a tangible device. Without the physical limitations of the physical storage medium, it is difficult to see from where the informational content of a file derives its rivalrousness.

6.40 Alternatively, in Chapter 10 we describe certain crypto-tokens as data structures which take on some level of functionality by their *instantiation*[540] within a particular active crypto-token system which is maintained and operated by a network of users. It is a particular instantiation of a data structure within an operating crypto-token system that we refer to as a crypto-token. We argue that crypto-tokens take on the

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539 J D Michels, C Millard, "The New Things: Property Rights in Digital Files" [2022] *The Cambridge Law Journal* 1, 13.

540 We discuss this term in detail in Chapter 10 at para 10.26.

characteristic of rivalrousness by virtue of the functional properties ensured by the rules of the system. It is difficult to see how this analysis could apply to a media file that exists as "a set of logical instructions…to reflect the file's content in binary code". The media file could be said to be instantiated within some physical storage medium. But then it would not fall within our third category for the reasons discussed above. It could instead be said to be instantiated within the second layer — the logical layer — of "perceptual cyberspace" described by Michels and Professor Millard. In the words of Michels and Professor Millard, this layer is:[541]

> The sense of space generated by the computer-user interface, through one or a combination of our senses, as opposed to the underlying "physical cyberspace" of hardware devices.

6.41 If the media file could be said to be instantiated within the second layer — the logical layer — of "perceptual cyberspace" then its rivalrousness would depend on the physical existence of humans (and their ability to perceive things). Alternatively, the collective human agreement on how media files can be accessed at the logical layer (for example, what Microsoft Word requires to access a .doc file) could be seen as analogous with a particular active crypto-token system that is maintained and operated by a network of users. On that analysis, media files could derive their rivalrousness from their functionality within that social "system", as maintained by the system rules. However, the loose collective human agreement on how media files can be accessed at the logical layer (even if reinforced by certain standard technology, such as .doc files) does not create rivalrousness in this way. There is nothing within this loose collective human agreement to prevent the media file[542] being replicated, along with its functionality. In other words, media files are not rivalrous by design[543] in the way that crypto-tokens are. The only argument against this is that copying a media file creates a distinct instance of a media file — a separate copy. But, if that is true, then the separate copy can only derive its rivalrousness from the physical storage medium on which it is recorded, and so the media file would not satisfy our criteria for the reasons discussed above. This is not the case for crypto-tokens, which we discuss in detail in Chapter 10.

Divestibility

6.42 The concept of divestibility is a helpful indicator when considering whether media files satisfy our criteria.

6.43 The "transfer" of a media file operates in a very specific way. For most transfers of media files, when Alice "transfers" a file to Bob, what actually happens is that a copy of the file is created on Bob's computer.[544] In this way, a "transfer" of a media file

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541 J D Michels, C Millard, "The New Things: Property Rights in Digital Files" [2022] *The Cambridge Law Journal* 1, 13.

542 As a set of instructions contained in a discrete specified group of data having its own access path, plus the informational content to which it refers.

543 We discuss the concept of rivalrousness by design in detail in Chapter 10 from para 10.88.

544 J D Michels, C Millard, "The New Things: Property Rights in Digital Files" [2022] *The Cambridge Law Journal* 1, 13; M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) paras 8-012 and 8-018.

operates more like a "transmission" of a copy of that file.[545] However, the initial copy of the file does not leave Alice's computer, meaning it is not normally possible for Alice fully to divest herself of it. If it is not possible for a file to be fully divested from the transferor on transfer, then that helps to answer the question as to what the nature of the file is.

6.44 Nor does a deletion of a media file work in the way that one might imagine. When a file is deleted from some physical storage medium, one might imagine that it disappears. However, this is not the case. The authors of *The Law of Personal Property* describe the process as follows:[546]

> Deletion typically simply means 'transferring' the file to a different folder location, often the computer system's recycle bin. Even emptying a file from a computer system's recycle bin does not delete the actual data itself but rather simply removes the reference to the file from the computer system's master file table,[547] the computer equivalent of a book's table of contents, which is what allows for data recovery even thereafter. Technically, it is only when this freed up space is written over with new data that the deleted data is irrecoverable and can truly be regarded as deleted.[548]

6.45 It might be possible for a media file to be fully divestible on transfer — to create and to transfer files in a way that the initial copy of the media file was destroyed. This was a technological feature of certain media files that were the subject of litigation in *Capitol Records LLC v ReDigi Inc*.[549] ReDigi created a system that ensured that the digital file was eliminated from the subscriber's computer during upload to an individualised storage space hosted by ReDigi, and hence resulted in a "migration" rather than a reproduction of the media file.[550]

6.46 Understanding how media files are transmitted and deleted helps to inform our application of the concept of rivalrousness. As we discuss above, and broadly speaking, if one person has something that is rivalrous, then other people cannot have it. Relatedly, replication can be defined as the creation of something that is exactly (or nearly exactly) the same as the original, of which it is a copy.[551] The fact that

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545 UK Jurisdiction Taskforce, "Legal Statement on cryptoassets and smart contracts" (November 2019), https://technation.io/lawtechukpanel/ para 62.

546 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-011.

547 "It keeps records of all files in a volume, the files' location in the directory, the physical location of the files on the drive, and file metadata.": C Gurkok, "Cyber Forensics and Incidence Response" in J R Vacca, *Computer and Information Security Handbook* (3rd ed 2017) pp 603, 609.

548 S R Ellis, "Cyber Forensics" in J R Vacca, *Computer and Information Security Handbook*, (3rd ed 2017) pp 573, 580 to 581, 591.

549 934 F Supp 2d 640 (SDNY 2013).

550 See J Huguenin-Love, "Song on Wire: A Technical Analysis of ReDigi and the Pre-Owned Digital Media Marketplace" (2014) 4(1) *New York University Journal of Intellectual Property and Entertainment Law*: https://jipel.law.nyu.edu/wp-content/uploads/2015/05/NYU_JIPEL_Vol-4-No-1_1_HugueninLove-SongOnWireRedigiAndPreOwnedDigitalMediaMarketplace.pdf.

551 The Cambridge Dictionary defines the noun "replication" as "the act of making or doing something again in the same way, or something that is made or done in this way", and the verb "to copy" as "to produce

somebody can make a copy of a thing does not affect the capacity of that individual thing to be rivalrous. For example, a locksmith can produce many copies of the same key, each of which is materially identical to the others. Alice's key is no less rivalrous for the fact that Bob has the same type of key which allows him to unlock the same door. The same is true of media files. Both the copied media file and the copy of a media file could be said to be rivalrous things — but only if there is some basis on which to derive the quality of rivarlousness. As we discuss above, in general that basis is the physical qualities of the physical storage medium on which the media file is recorded. Even in the case of *Capitol Records LLC v ReDigi Inc,* each copy of a media file would need to be rivalrous in some way if it were to satisfy our criteria. As we suggest above, the most likely means that such a file could be rivalrous is by its assumption of the physical properties of the physical storage medium on which it is recorded.[552]

6.47 For completeness, we note that there are some functional, economic arguments that replication of a media file — particularly if it is trivially easy and/or cheap to make a copy — looks like it may undermine rivalrousness. The fact that Alice's use of an object prejudices Bob's ability to use it seems to be of less significance if Bob can easily and cheaply acquire a copy that he can then use himself. And the easier and cheaper it is for a copy to be created, the more that this is so.

6.48 Perhaps for this reason, some consultees who responded to our call for evidence suggested that the concept of rivalrousness should be interpreted such that it does not apply to objects that can be readily replicated. Professors Fox and Gullifer, for example, defined rivalrousness as meaning, in part, that "it should be impossible to copy the asset".[553] Similarly, Professor Allen referred to rivalrousness "in the economics sense" as meaning that "the 'object' cannot be enjoyed by an arbitrary number of parties without prejudice to some parties' enjoyment" *and* "that duplication entails a marginal cost".[554]

6.49 On balance, we have not adopted these functional, economic arguments in our criterion of rivalrousness. We consider that the arguments fall more naturally in a

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something so that it is the same as an original piece of work": "Replication", *Cambridge English Dictionary*: https://dictionary.cambridge.org/dictionary/english/replication; "Copying", *Cambridge English Dictionary*: https://dictionary.cambridge.org/dictionary/english/copying.

552 Note, however, that James Higuenin-Love makes the argument that it is not the physical storage medium itself that is rivalrous and is instead the electrical charge and magnetic fields: "The key point of this analysis is that when digital files are transferred from magnetic hard drives and, certainly, solid-state drives, no new material object is created because the electrical charge and magnetic fields that constitute the data are actually transferred from waypoint to waypoint. A more insightful way to conceptualize such data storage is to view the electrical charge and magnetic fields as material objects themselves, rather than assigning that role to the magnetic storage layer or transistor." See J Huguenin-Love, "Song on Wire: A Technical Analysis of ReDigi and the Pre-Owned Digital Media Marketplace" (2014) 4(1) *New York University Journal of Intellectual Property and Entertainment L*aw: https://jipel.law.nyu.edu/wp-content/uploads/2015/05/NYU_JIPEL_Vol-4-No-1_1_HugueninLove-SongOnWireRedigiAndPreOwnedDigitalMediaMarketplace.pdf.

553 Professors Fox and Gullifer also said that rivalrousness meant that "the asset would have to be of a kind that meant that two people could not use it simultaneously without causing interference to each other".

554 The marginal cost of production is the additional cost of producing a further unit of a given type of resource: J Sloman, A Wride, *Economics* (7th ed 2009) p 133.

broader consideration of the indicator of divestibility, which helps to indicate whether or not a data object is truly rivalrous.

Conclusion on media files

6.50 On balance, we provisionally conclude that on either of the different analyses described above, media files in general do not satisfy our proposed criteria of data objects and therefore that they fall outside our suggested third category of personal property.

6.51 This analysis applies to the way in which digital files are currently structured. We accept that it may be possible, in the future, for them to be structured in different ways such that they do meet our criteria.

Consultation Question 7.

6.52 We provisionally conclude that media files do not satisfy our proposed criteria of data objects, and therefore that they fall outside of our proposed third category of personal property. Do you agree?

6.53 Regardless of your answer to the above question, do you think that media files should be capable of attracting personal property rights?

Program files

6.54 Next, we consider program files. In general, program files are "executable digital files consisting of code, ie machine language, that can run on computers".[555]

6.55 A program file, like a media file, comprises an informational element. Unlike a media file, the informational element takes the form of instructions,[556] or "[a] set of statements that … can be executed by a computer in order to produce a desired behaviour from the computer."[557] The authors of *The Law of Personal Property* note that:[558]

> Although software is "[a] generic term for those components of a computer system that are intangible rather than physical", "[i]t is most commonly used to refer to the programs executed by a computer system"[559] and may thus be regarded as synonymous with computer programs.

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555 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-003.

556 K Moon, "The Nature of Computer Programs: Tangible? Goods? Personal Property? Intellectual Property?" (2009) 31 *European Intellectual Property Law Review* 396, 401.

557 A Butterfield, G E Ngondi and A Kerr, *A Dictionary of Computer Science* (7th ed 2016).

558 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-020.

559 A Butterfield, G E Ngondi and A Kerr, *A Dictionary of Computer Science*, (7th ed 2016). For an alternative view, see K Moon, "The nature of computer programs: tangible? goods? personal property? intellectual property?" (2009) 31 *European Intellectual Property Law Review* 396.

6.56 We consider program files separately in this section for two reasons. First, given that program files comprise an informational element, we want to ensure that the law of England and Wales does not inadvertently begin to treat information as an appropriate object of property rights, for the reasons discussed in Chapter 3. Second, there is a legal question as to whether program files are properly to be treated as goods within sales laws such as the Sale of Goods Act 1979 or the Supply of Goods and Services Act 1982.

6.57 Moon notes that the enquiry as to whether a program file is an appropriate object of property rights is only relevant for program files which are not merged with removable storage media.[560] If a program is supplied on a compact disc ("CD"), for example, the instructions to execute the program are written on the CD in the same way in which instructions could be written on paper. In that case, the program is a part of the CD, as becomes apparent if we compare this to a hardcopy instruction manual: if the instructions are flawed, that would be considered a flaw in the manual.[561] The argument is similar for those program files that are otherwise stored on some other physical storage medium. On that basis, we consider that the arguments made above in relation to whether our criteria apply to media files are equally applicable to those program files that are otherwise stored on some physical medium.

6.58 Notwithstanding this point, the authors of *The Law of Personal Property* argue that:[562]

> It is possible to retain the characterisation of a contract for the supply of [a program file] as a sale if it were conceived as a sale of a licence rather than a sale of either a [the program file itself] or any part of its intellectual property rights.

6.59 In this sense, a sale of a program file would not constitute a sale of a data object (a program file as a licence would not fall within our third category of personal property because a licence is not independent of the legal system). Nor would it constitute a sale of intangible informational content that was treated as capable of attracting property rights. Instead, a sale of a program would simply be a sale of a licence to use a corresponding copy of a program file (including the informational content and any use of that informational content within the purchaser's own physical storage media). We note however that this view remains contentious.[563]

6.60 There is an important nuance to the above. For many years, online or digital sales have not been characterised as sales of objects of personal property rights. However, as we discuss in this consultation paper, we consider that it is possible to create objects of property rights — data objects — that satisfy our criteria and so fall within our suggested third category of personal property. It is possible that, in the future,

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560 K Moon, "The Nature of Computer Programs: Tangible? Goods? Personal Property? Intellectual Property?" (2009) 31 *European Intellectual Property Law Review* 396 406.

561 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-024, referring to *St Albans City and District Council v International Computers Ltd* [1996] EWCA Civ 1296, [1997] FSR 251.

562 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-029.

563 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-029, referring to *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10 (Ch), [2012] 3 WLR 83; *Re Celtic Extraction Ltd* [2001] Ch. 475; and *Swift v Dairywise Farms Ltd* [2000] 1 WLR 1177, [2000] 1 All ER 320.

program files could be structured so that they satisfy our criteria. Perhaps more likely is that online sales will develop such that data objects are sold as objects in themselves and that those objects are linked to certain other things, legal rights or information (including, perhaps, the informational content of program files, or licences to use certain informational content). We discuss in detail the ways in which such linking might be achieved in Chapter 14 and how licences might be linked to NFTs in Chapter 15.

6.61 For those reasons, and in general, we provisionally conclude that digital files (either media files or program files) do not satisfy our proposed criteria of data objects, and therefore that they fall outside of our proposed third category of personal property. However, we do not intend this analysis to suggest that no digital files could ever fall within our proposed third category — certain digital files could already satisfy our criteria. Moreover, we consider that in future it would be possible that digital files could be designed in such a way that they exhibit those characteristics, and therefore fall within our suggested third category of data objects. Finally, market participants should be able to structure their arrangements such that things that do not fall within our third category of personal property can be linked in some way to data objects that do satisfy our proposed criteria. In this way, we consider that our proposals allow the greatest degree of flexibility for market participants to structure their arrangements as they choose.

Consultation Question 8.

6.62 We provisionally conclude that program files do not satisfy our proposed criteria of data objects, and therefore that they fall outside of our proposed third category of personal property. Do you agree?

6.63 Regardless of your answer to the above question, do you think that program files should be capable of attracting personal property rights?

DIGITAL RECORDS

6.64 A digital record is simply some kind of informational content stored in digital or electronic form. Digital records encompass all kinds of digital information storage systems, a classic example being a database. Digital records can be used for many different purposes, including for the purpose of recording property rights. For example, bank ledgers are increasingly kept in digital or electronic form. In that sense a digital bank ledger is simply a digital record used to record a bank debt (the bank debt itself being a thing in action, as we discuss in Chapter 4).

6.65 It is important to note that a digital record should be considered separately from any property right that it records. There has been some confusion in this respect in case law. For example, the authors of *The Law of Personal Property* note that there is a tendency to regard the record of intangible property rights as itself having a proprietary character. They give the example of the case of *Armstrong v*

Winnington,[564] in which carbon trading allowances were said to exist "only in electronic form", because the record of a carbon trading allowance only exists in electronic form.[565] We discuss various types of carbon emissions trading schemes in more detail in Chapter 9.

6.66 We provisionally conclude that digital records do not satisfy our proposed criteria of data objects, and therefore that they fall outside of our proposed third category of personal property. This is for the reasons discussed above in relation to digital files (although we accept that it is possible for digital records to be constituted of data represented in an electronic medium, including in the form of computer code, electronic, digital, or analogue signals).

6.67 However, we note that it is possible for some data objects (that is, objects that do satisfy our proposed criteria and do fall within our suggested third category of personal property rights) to be used for record keeping purposes. We discuss this structuring option in more detail in Chapter 14.

Consultation Question 9.

6.68 We provisionally conclude that digital records do not satisfy our proposed criteria of data objects, and therefore that they fall outside of our proposed third category of personal property. Do you agree?

6.69 Regardless of your answer to the above question, do you think that digital records should be capable of attracting personal property rights?

564 [2012] EWHC 10 (Ch), [2012] Bus LR 1199.

565 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-031.

Chapter 7: Email accounts and certain in-game digital assets

INTRODUCTION

7.1 In this chapter we consider email accounts and in-game digital assets and apply our criteria to them. We chose to group these seemingly unrelated types of digital asset together because a principal unifying feature of those digital assets[566] is that they are provided to users under some form of contractual agreement, such as an end-user licence agreement ("EULA").

7.2 We suggest that in general, although possibly not in every example, email accounts and in-game digital assets (as they are currently constructed) are unlikely to satisfy the criteria of data objects and so they would not fall within our suggested third category of personal property. This is because, in general, email accounts and in-game digital assets are structured such that the account holder, or the player, only has (contractual) rights against the service provider of the email account or the in-game digital asset. The email account or the in-game digital asset is normally dependent on the continuous supply of the service provider's services and information technology infrastructure, as well as a continuing licence to use the service provider's intellectual property. In general, these three things will be governed by a complex contractual agreement (or set of contractual agreements) that describe the parameters of the relationship between the account holder or player and the service provider.[567]

7.3 This means that, broadly speaking, those email accounts or in-game digital assets that are structured in this way will not satisfy the criteria of having an existence that is independent of the legal system. We discuss the application of our criteria to these types of digital asset in more detail below.

7.4 We conclude this chapter by considering how recent technological developments could lead to further legal structuring innovation and experimentation in respect of in-game digital assets.

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566 As they are currently constructed, and in general.

567 For example, the United States District Court, Eastern District of Pennsylvania in *Bragg v Linden Research* 487 F.Supp.2d 593 (2007): "Before a person is permitted to participate in Second Life [a multiplayer online game], she must accept the Terms of Service of Second Life (the "TOS") by clicking a button indicating acceptance of the TOS". In relation to email accounts, see eg H Y-F Lim, "Is an Email Account 'Property'?" (2011) 1 *Property Law Review* 59, 60: "The contract between the email service provider and the email account holder is usually contained in the Terms of Service."

For example, Google accounts – including email accounts – are governed by complex terms of service, available at Google, "Privacy and terms": https://policies.google.com/terms?hl=en-US#toc-what-you-expect. Similarly, accounts created with game developer Blizzard are governed by terms of service available at Blizzard, "Blizzard End User License Agreement": https://www.blizzard.com/en-gb/legal/fba4d00f-c7e4-4883-b8b9-1b4500a402ea/blizzard-end-user-license-agreement.

EMAIL ACCOUNTS

Email accounts as things

7.5 Email accounts are tied to email addresses, which are used to send email messages over the internet. The way in which email communication is transmitted is dictated by the applicable mail transfer protocol. One example of a mail transfer protocol is the Simple Mail Transfer Protocol ("SMTP").

7.6 Through this protocol, a server called a mail user agent ("MUA") sends a message to another server called a mail transfer agent ("MTA"). This message is then directed to the ultimate receiving server, another MUA. Sometimes, the message passes through other MTAs, which can be relays[568] or gateways,[569] on its way to the ultimate MUA. The message is routed using the mail exchanger ("MX") records in the domain name system ("DNS"), which identify the next destination of the message.[570] These records point to the location where emails addressed to a specific domain name should be directed. At a simplified level, an analogy could be drawn with physical postal services. When a letter is posted, it is delivered to a succession of postal offices which approximate the destination of the letter and pass it on until it finally reaches the last post office — the one closest to its final destination.[571] It is then distributed by the postman to the individual addressee. Mail transfer protocols are a set of rules which specify how this process is to be achieved online.

7.7 SMTP is a server-to-server protocol, meaning it deals only with the delivery of emails to a server, not to the specific mailboxes which individual users usually access.[572] Once emails reach an MUA, the allocation of emails between mailboxes is done using client/server protocols.[573] The most common examples of these protocols are the Post Office Protocol ("POP"),[574] and the Internet Message Access Protocol ("IMAP").[575]

7.8 An email mailbox is a depository. It is identified by a particular character string pointing to the location to which email messages are ultimately sent through

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568 A relay transports the message using the SMTP, acting as a new MUA: J Klensin, *Simple Mail Transfer Protocol* (October 2008): https://datatracker.ietf.org/doc/html/rfc5321#section-1.1 p 8.

569 A gateway transports the message using a protocol other than SMTP: J Klensin, *Simple Mail Transfer Protocol* (October 2008): https://datatracker.ietf.org/doc/html/rfc5321#section-1.1 p 8.

570 J Klensin, *Simple Mail Transfer Protocol* (October 2008): https://datatracker.ietf.org/doc/html/rfc5321#section-1.1 pp 26 to 27.

571 See eg E Krol, *The Whole Internet User's Guide & Catalog* (1994) pp 105 to 106.

572 G Howser, "Simple Mail Transfer Protocol: Email" in G Howser, *Computer Networks and the Internet* (2020) p 385.

573 Above.

574 Network Working Group, *Post Office Protocol - Version 3* (May 1996): https://datatracker.ietf.org/doc/html/rfc1939.

575 Internet Engineering Task Force (IETF), *Internet Message Access Protocol (IMAP) - Version 4rev2* (August 2011): https://datatracker.ietf.org/doc/html/rfc9051

client/server protocols.[576] The standard name for a mailbox is “name@domain”, an example being “alice@hotmail.com”.

7.9 The interaction between individual users and these protocols is facilitated by mailbox providers, such as Gmail or iCloud:[577]

> "Mailbox Provider" refers to an organization that accepts, stores, and offers access to… messages ("email messages") for end users. Such an organization has typically implemented SMTP… and might provide access to messages through IMAP…, the Post Office Protocol (POP)…, a proprietary interface designed for [hypertext transfer protocol]…, or a proprietary protocol.

7.10 Accordingly, the mailbox provider will take the steps to implement SMTP, such as administering the domain name which represents the “domain” part of an email address and any relevant servers. It will also implement POP, IMAP, or a similar protocol to distribute incoming emails to its users.

7.11 Mailbox providers enable users to send emails, and they may provide additional services such as filtering spam messages. Users create one account which enables them to access a broader suite of services provided by one supplier. For example, an Apple account enables users to access iCloud mail services, cloud storage facilities or the iTunes store, among others.

7.12 We conceptualise email accounts in this broader sense, to test whether an email account is capable of being a data object within our third category of personal property. An alternative candidate for the thing that could be an object of property rights is the mailbox itself. We do not adopt that reasoning in this chapter, because access to a mailbox is normally determined by a mailbox provider. When a person creates an account with an email service, they confirm that they agree to the terms of service of the EULA under which the account is provided. Those terms might allow the user to take some property-like actions in relation to the account, for example by transferring it to other persons, and are likely to give a user the opportunity to access and use a mailbox. However, the account itself and access to the mailbox in general exists only pursuant to a contractual right against the mailbox provider.

APPLICATION OF OUR CRITERIA TO EMAIL ACCOUNTS

Data represented in an electronic medium

7.13 As described above, email accounts can in some ways be thought of as consisting of data represented in an electronic medium — at least in the sense that a mailbox exists as a string of data which represents the intended destination, or the origin, of a message. It is of course less easy for that data properly to be described as definable or identifiable when it consists of an email account with a mailbox provider in a wider sense.

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576 J Klensin, *Simple Mail Transfer Protocol* (October 2008) p 15: https://datatracker.ietf.org/doc/html/rfc5321#section-1.1.

577 J D Falk, *Creation and Use of Email Feedback Reports: An Applicability Statement for the Abuse Reporting Format (ARF)* (June 2012) p 4: https://datatracker.ietf.org/doc/html/rfc6650.

7.14 Nevertheless, we think there is at least an argument that an email account meets our gateway criterion of being composed of data represented in an electronic medium.

Independent existence

Existence independent of persons

7.15 Email accounts, considered as consisting of data represented in an electronic medium, can be separated from a person — they do not require a person for their continued existence. Many email accounts are provided under the terms of a EULA and effectively grant a personal licence to a user. On that basis, it could be argued that email accounts are inextricably associated with particular persons and therefore not independent of persons. However, we consider that such restrictions are merely terms of the contract in question and not necessarily a feature of the email account itself. Indeed, it is possible to structure email accounts such that the rights thereunder were assignable by a user or such that the account was made available to relatives on the death of a user, which demonstrates that they can exist independently of persons. In contrast, this would not be possible with something inextricably linked to a person, such as a personality or a friendship.

Existence independent of the legal system

7.16 We do not consider that email accounts exist independently of the legal system, at least in the way in which they are provided to users at present. In general, a mailbox provider supplies its services under a contract — the EULA. Any rights available to a customer under an email account therefore consist of a legal relationship between persons, and, for this reason, it is difficult to conceptualise an email account as existing as an independent, freestanding thing. Without the legal relationship with the mailbox provider, the end user would not have an email account, and would not have access to a mailbox.[578]

7.17 We discuss transferability in more detail in our section on divestibility below. However, it is important to note at this stage that most mailbox providers will not permit end users to transfer their rights — normally this is expressed as a prohibition under the applicable terms of service.[579] Nevertheless, it is the provisions of the EULA which regulates access to a mailbox and contains these prohibitions on transfer.

7.18 Regardless of the transferability or otherwise of a EULA, it remains a contractual right — a thing in action — and therefore, would fall outside our third category of personal property. The email account is necessarily supplied to the end user by a counterparty to the EULA — the licensor. Both legally and factually, the existence of an email account is dependent on the existence of a mailbox provider which maintains the infrastructure necessary to implement the necessary protocols, making its services available to end users through contract.

7.19 Ultimately, the fact that email accounts are structured as services provided under EULAs prevents an email account from satisfying this criterion. The mailbox provider is supplying the user with the right to use its services to send and receive emails. This

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[578] See para 7.9 above.

[579] For example, Google, "Privacy and terms": https://policies.google.com/terms?hl=en-US#toc-what-you-expect.

means that, to use the email account, the account holder depends on the continued provision of services from the mail client. The mailbox provider will usually reserve the right to terminate a user's account in some situations, where the user breaches their terms of service.[580] In addition, the terms of service are often explicit in that they grant no property right to any objects of property rights.

7.20 For example, Apple's terms of service provide that:[581]

> Nothing in this Agreement shall be construed to convey to you any interest, title, or license in an … email address, domain name … or similar resource used by you in connection with the Service.
>
> Apple … [owns] all legal right, title and interest in and to the Service, including but not limited to graphics, user interface, the scripts and software used to implement the Service, and any software provided to you as a part of and/or in connection with the Service (the "Software"), including any and all intellectual property rights …. You agree that you will not use such proprietary information or materials in any way whatsoever except for use of the Service in compliance with this Agreement.
>
> The use of the software or any part of the service, except for use of the service as permitted in this agreement, is strictly prohibited and infringes on the intellectual property rights of others and may subject you to civil and criminal penalties, including possible monetary damages, for copyright infringement.

7.21 In summary, email accounts supplied under EULAs are not independent of the legal system. They are complex licences entered into by the mailbox provider and the end user. Licences, as contractual rights, only exist insofar as there is a legal system in place which provides for their continued existence.[582]

Rivalrousness

7.22 Professor Fairfield describes email accounts as personal spaces unique to people on the internet.[583] He considers that email accounts are rivalrous, and they have the requisite degree of permanence unless destroyed — deleted — by the "owner". He argues that they are also interconnected, meaning that they are located within a network and that other people can interact with them. In other words, he suggests they are rivalrous by design.[584]

7.23 We agree that mailboxes are rivalrous. They point to unique locations, which exist under unique domain names. It would not be possible to register the same email address as one already in existence. The same address — meaning the same string — cannot resolve to two different locations at the same time. Someone can know the

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580 For example, mailbox providers may terminate users' accounts if they engage in spam, phishing or fraudulent activities (eg Microsoft, "Services agreement": https://www.microsoft.com/en-gb/servicesagreement/; Google, "Privacy and terms": https://policies.google.com/terms?hl=en-US#toc-software).

581 Apple, "Legal": https://www.apple.com/legal/internet-services/icloud/.

582 See Chapter 5, from para 5.35.

583 J Fairfield, "Virtual property" (2005) 85 *Boston University Law Review* 1047.

584 Above, 1055 to 1056.

address, but they will not be able to use it in the same way as the associated end user, due to the overarching email protocol which prohibits this. Seen in this way, mailboxes could be instances of rivalrous objects generated through their instantiation within a particular protocol.

7.24 However, email accounts more broadly are different. The use of and interaction with the protocol is undertaken by mailbox providers, who use their own resources for this purpose. In this sense, it is less clear whether an email account more broadly could properly be described as rivalrous, although we consider that it is possible to treat rights against persons as rivalrous.

Divestibility

7.25 In general, and as we noted in Chapter 2, restrictions on the ways in which one may use their objects of property rights do not negate the proprietary status of those objects.[585] However, it is important to differentiate between restrictions which apply to the use of a specific type of object of property and terms under which a service provider makes their service available. For example, the fact that there are restrictions on a pharmacist's ability to sell medicine[586] does not prevent the medicine from being an object of property rights.[587] Therefore, although the terms of service of many mailbox providers do restrict the transfer of email accounts, that does not necessarily prevent an email account from being an object of property rights (if it were otherwise able to satisfy our criteria).

7.26 Notwithstanding the above, email accounts are not usually divestible. Their divestibility will, in general, depend on the terms of the licence between the user and the service provider. Professor Hannah Yee-Fen Lim, in her review of Yahoo!, Gmail and Hotmail terms of service, identified only one clause in the Gmail terms of service which would permit an assignment of the account.[588] This term was drafted as a fairly narrow exception, and it is worth noting that, as of July 2022, the term was no longer included in Google's terms of service.[589]

7.27 Microsoft similarly prohibits its end users from:[590]

> [assigning], [transferring] or otherwise [disposing] of these Terms or any rights to use the Services. … These Terms are solely for your and our benefit. It isn't for the benefit of any other person, except for Microsoft's successors and assigns.

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585 See *Yearworth v North Bristol NHS Trust* [2009] EWCA Civ 37, [2009] 2 All ER 986; *Club Cruise Entertainment v Department of Transport* [2008] EWHC 2794 (Comm); [2009] 1 Lloyd's Rep 201.

586 For example, "a person may not sell or supply a prescription only medicine except in accordance with a prescription given by an appropriate practitioner": Human Medicines Regulations 2012, reg 214(1).

587 *Yearworth v North Bristol NHS Trust* [2009] EWCA Civ 37, [2009] 2 All ER 986 at [45](f)(ii).

588 H Y-F Lim, "Is an Email Account 'Property'?" (2011) 1 *Property Law Review* 59, 61.

589 Google, "Privacy and Terms": https://policies.google.com/terms?hl=en.

590 Microsoft, "Services agreement": https://www.microsoft.com/en-gb/servicesagreement/.

7.28 Apple also provides that end users' accounts are non-transferrable and that their rights terminate on death.[591]

7.29 Therefore, the ability of account holders to assign or to transfer their account, or licence is, in general, prevented by the terms of the licence. As we suggest above, this does not necessarily mean that an email account could not be an object of property rights, were it able to satisfy our criteria otherwise. Instead, we think that it suggests that email accounts are properly characterised as rights against a mailbox provider — a thing in action. Indeed, some terms describe the relationship expressly as a personal licence rather than a property right.[592]

7.30 We provisionally conclude that email accounts do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. Email accounts are ultimately supplied to end users under licences, which is a fundamental obstacle to them being data objects within our suggested third category of personal property rights.

Consultation Question 10.

7.31 We provisionally conclude that email accounts do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. Do you agree?

7.32 Regardless of your answer to the above question, do you think that email accounts should be capable of attracting personal property rights?

IN-GAME DIGITAL ASSETS

7.33 In-game digital assets are another common type of digital asset and are increasingly important in the modern world. Examples of in-game digital assets include "skins" (avatar outfits),[593] collectibles,[594] weapons,[595] and even virtual land and buildings.[596] These in-game digital assets are, in general, used to enrich a player's experience of a game, or to enable them to perform better within that game. Depending on the in-game digital asset in question, players or market participants might be able to engage in the purchase and trading of in-game digital assets between themselves, often on special purpose-built trading platforms such as the Steam Community Market.[597] Therefore, many in-game digital assets have marketable value.

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591 Apple, "Legal": https://www.apple.com/legal/internet-services/icloud/.

592 Google, "Privacy and Terms": https://policies.google.com/terms?hl=en.

593 For games such as Fortnite.

594 For games such as Roblox.

595 For games such as Counter Strike: Global Offensive or Dota 2.

596 For games such as Second Life.

597 https://steamcommunity.com/market/.

In-game digital assets as things

7.34 The starting point when considering an in-game digital asset is to identify the thing in question. This is not necessarily an easy task. In many cases, what the thing in question is will depend on how the in-game digital asset is structured and may also depend on the contractual terms to which players agree. There are two possible views as to what the thing that constitutes an in-game digital asset is:

(1) Some form of reified, or independently existing, object which exists in a digital world.[598]

(2) A mixture of information located on servers and computers, software, intellectual property rights and contractual rights.[599]

7.35 The Pennsylvanian case of *Bragg v Linden Research*[600] raised the issue of what an in-game digital asset is. The case was settled out of court, which means that there was no public judicial consideration of the legal status of in-game digital assets.[601] However, the issues and arguments presented are informative.

7.36 A Second Life player had found a way to abuse the in-game land auction system to purchase land at a price significantly lower than market value. Having found out that this had occurred, Linden Research, the game developer, suspended the player's account. The player sued Linden Research on the basis that it had interfered with his (property) rights in respect of his virtual land by suspending his account.

7.37 The response from Linden Research was that the player did not actually have a property right in respect of any virtual land, or indeed anything at all. They argued that what he actually had was a licence to access Linden Research's proprietary servers, storage space, bandwidth, memory allocation and computational resources to participate in the game.[602] Participation was specified by contract to be on terms set by Linden Research, which entitled them to close a player's account if and when the player did not abide by the established rules.

7.38 However, as Professor Hannah Yee-Fen Lim explains, representatives of Linden Research had specifically stated that landowners actually "owned" objects of property in the game.[603] She suggests that this created expectations among the game players

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598 See eg H Y-F Lim, "Virtual world, virtual land but real property" (2010) *Singapore Journal of Legal Studies* 304 and J Fairfield, "Virtual property" (2005) 85 *Boston University Law Review* 1047.

599 See M Bridge, G McMeel, L Gullifer and K Low, *The Law of Personal* Property (3rd ed 2021) paras 8-059 to 8-062.

600 487 F. Supp. 2d 593 (United States District Court for the Eastern District of Pennsylvania).

601 The Court only considered a motion to dismiss the case for lack of personal jurisdiction and a motion to compel arbitration.

602 *Bragg v Linden Research* 487 F. Supp. 2d 593 at [8].

603 H Y-F Lim, "Virtual world, virtual land but real property" (2010) *Singapore Journal of Legal Studies* 304, 312, referring to Guardian Unlimited: Gameblog, "Second Life and the Virtual Property Boom" (14 June 2005).

as to their legal rights, which would be subverted if they were not in fact the "owners" of some form of in-game property.[604]

7.39 By reference to the case, Professor Hannah Yee-Fen Lim argues that in-game digital assets acquire some proprietary nature over and above the terms of the licence imposed by the developers.[605] She suggests that limitations of use of a thing are not incompatible with ownership of a thing, especially considering the fact that Second Life's terms of service provided for a player's ability to control the land which they owned in the game. They were able to exclude others, to subdivide it, or sell the in-game land in question.[606] The contract gave either party the discretion to terminate at will. Professor Hannah Yee-Fen Lim suggests that this ought not affect the proprietary nature of the thing in question. The suggestion is that the property in the in-game digital asset is something different from the intellectual property in it.[607]

7.40 On the other hand, the authors of *The Law of Personal Property* consider that identifying an asset as separate from the intellectual property in the content and the infrastructure is even more difficult for in-game digital assets than it is for digital files.[608] In particular, it is difficult to identify the relevant thing at the level of the graphic user interface ("GUI") for massively multiplayer online role playing games ("MMORPGs"). These games involve the communication between a player's device and servers which create the game world. These servers allow the player to communicate not only with the servers themselves, but also with other players. To run the client software which connects the player to the server, it is necessary to obtain a licence, otherwise the player is in breach of the intellectual property rights in the software. The authors of *The Law of Personal Property* argue that it would be impossible to conceive of an object which is separate from this entire ecosystem. It would be possible to copy the code which constitutes an object, but the code itself would be useless without the licence to run the software, without a server which is continuously maintained, and without the other players.[609]

7.41 We agree that when considering an in-game digital asset, it is extremely difficult to point to a standalone thing that could be the object of property rights. Instead, the in-game digital asset exists as the result of a combination of infrastructure, intellectual property, and servers which enable a network of players to play together in the same ecosystem. However, all of these things are themselves the objects of property rights held by, among others, the game developer, or of some platform that supplies its services to players. It is not possible, on our view, to divorce the in-game digital asset as a standalone thing from this proprietary system. In line with this conception of in-game digital assets, we suggest that, in general, they:

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604 H Y-F Lim, "Virtual world, virtual land but real property" (2010) *Singapore Journal of Legal Studies* 304, 315.

605 Above, 319.

606 Above, 320 to 321.

607 H Y-F Lim, "Virtual world, virtual land but real property" (2010) *Singapore Journal of Legal Studies* 304, 306. See also J Fairfield, "Virtual property" (2005) 85 *Boston University Law Review* 1047, 1096.

608 M G Bridge, G McMeel, L Gullifer, K F K Low, *The Law of Personal Property* (3rd ed 2021) para 8-061. We discuss digital files In Chapter 6.

609 M G Bridge, G McMeel, L Gullifer, K F K Low, *The Law of Personal Property* (3rd ed 2021) para 8-061.

(1) are not constituted of distinct, definable or identifiable data represented in an electronic medium;

(2) exist independently of persons but do not exist independently of the legal system;

(3) are not rivalrous; and

(4) may be divestible depending on the terms of the licence.

7.42 We explain our reasoning below. However, from paragraph 7.61 onwards, we consider how it may become possible in future for in-game digital assets to be structured in ways that could make them data objects in our third category.

APPLICATION OF OUR CRITERIA TO IN-GAME DIGITAL ASSETS

Data represented in an electronic medium

7.43 In-game digital assets are made up of data which can be processed by computers, leading to the on-screen representations of digital assets. However, we believe that it is difficult, for this type of digital asset, to determine what exactly are the distinct, definable or identifiable data which constitute the digital asset. An image of an in-game digital asset such as a skin or in-game item is represented as part of a rendering produced by the game engine, which changes as the overall representation of the game changes, including through various perspectives. In this context, it is not straightforward to identify a discrete, definable or identifiable set of data or data structure which constitutes the digital asset. Equally, it would not be possible to speak of a meaningful discrete dataset, considering the fact that the data only derive meaning as in-game digital assets within a wider digital ecosystem constituted of hardware, software, and a network of players.[610]

7.44 Alternatively, an in-game digital asset could be constituted as a ledger entry recorded or represented by some data represented in an electronic medium, including in the form of computer code, electronic, digital or analogue signals. In that case, this criterion would be satisfied.

Independent existence

Existence independent of persons

7.45 If it is possible to characterise in-game digital assets as consisting of data represented in an electronic medium, we think that they can be separated from a person — they do not require a person for their continued existence. We think this is for the same reasons as discussed in relation to email accounts (above). A particular in game asset is not inextricably associated with particular persons (even if the personal licence is expressed as non-assignable) and can exist independently of persons. Indeed, many in-game assets are in fact sold or transferred to other persons (which we discuss below).

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[610] M Bridge, G McMeel, L Gullifer and K Low, *The Law of Personal* Property (3rd ed 2021) para 8-061.

Existence independent of the legal system

7.46 If in-game digital assets are constituted as EULAs to use the developer's software and intellectual property to participate in a game-world, then they are not independent of the legal system. Licences, as contractual rights, exist only as a consequence of the application of the rules in a legal system.

7.47 As the authors of *The Law of Personal Property* argue, there is no asset without the software and other intellectual property which is provided under a licence by the game operator, and without an information technology infrastructure which needs to be maintained.[611]

7.48 Kennedy describes in-game digital assets as "an arrangement of digital information in the memory of a server", which require the technological infrastructure to give them expression.[612] They require the existence of a game developer, programmers, and an interconnected network of computers which enable the player to participate in a shared story. They are also not secure, and they can disappear at any time if the operators decide to shut down the game.[613] The difference between these types of items and other network-based assets, such as crypto-tokens, is the fact that the continued is contingent on the continuous supply of contractual services (that is, the provision of access to the specific software and servers) by one entity — the game developer. In this respect, we agree with the argument put forward by Linden Research in the *Bragg v Linden* case: a player has only a licence to use what is in fact the intellectual and physical property of the game developer.

Rivalrousness

7.49 There is arguably not a thing which can be considered separate from the information or the hardware where the in-game digital assets are information stored on a server, transferred to the player's computer, interpreted by software, and presented as virtual objects. Considered in this way, in-game digital assets are impossible to separate from the server, the existence of which is necessary for their continued existence. Copying the information that makes up the in-game digital asset, albeit cheap and easy, has no use value in the same way that it does for digital files. As explained above, a player would need a licence to run the software, a fully functioning server, and other players who would play on their copy of the server. Otherwise, the copy of the information itself is meaningless.[614]

7.50 There is an argument that because it is possible to trade some in-game digital assets — where the system in fact allows such trade to take place — that demonstrates that there is a distinct, identifiable thing that can be the subject matter of a trade. However, we suggest that these trades do not operate as trades of standalone, discrete things that are capable of being objects of property rights.

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611 M Bridge, G McMeel, L Gullifer and K Low, *The Law of Personal* Property (3rd ed 2021) para 8-061.

612 R Kennedy, "Virtual Rights: Property in Online Game Objects and Characters" (2008) 17 *Information and Communications Technology Law* 95, 100.

613 Above.

614 M Bridge, G McMeel, L Gullifer and K Low, *The Law of Personal* Property (3rd ed 2021) para 8-061.

7.51 As Kennedy argues, when individual in-game digital assets are tradeable, identifying what is actually being traded is difficult. Real world trading does not involve copying protected elements. Similarly, when in-game digital assets are traded in the game world, there is no copying taking place. As a result, trading cannot be considered an instance of intellectual property infringement. This is why game developers usually rely on EULAs to prohibit real-world trading of in-game digital assets.[615] They also use EULAs more generally to set out the terms under which trading occurs.

7.52 The Steam Community marketplace terms of service describe trades in the following way:[616]

> …The rights to access and/or use any Content and Services accessible through Steam are referred to in this Agreement as "Subscriptions."
>
> …
>
> Steam may include one or more features or sites that allow Subscribers to trade, offer or order certain types of Subscriptions (for example, license rights to virtual items) with, to or from other Subscribers ("Subscription Marketplaces"). An example of a Subscription Marketplace is the Steam Community Market. By using or participating in Subscription Marketplaces, you authorize Valve, on its own behalf or as an agent or licensee of any third-party creator or publisher of the applicable Subscriptions in your Account, to transfer those Subscriptions from your Account to give effect to any trade or sale you make.

7.53 Therefore, the trade that occurs on the Steam Community marketplace is in fact a trade of a right to use or access content, or of "subscriptions". Trades represent trades of discrete "bits" or "parts" of content or services that may be traded in the context of a broader agreement which the player enters with Steam.

7.54 So it appears that traders of in-game digital assets are trading (sometimes sub-divided) parts of their licences to use a particular service, and this trading is facilitated by particular marketplaces. This is different to traders trading distinct things as distinct objects of property rights.

Divestibility

7.55 As outlined above, it is difficult to determine what is being traded when players trade in-game digital assets. If in-game digital assets are part of a wider licence to use intellectual property and infrastructure, they are likely to be divestible, particularly given that marketplaces do allow for trading bits or parts of those licences.

7.56 However, the terms of various video game developers and platforms explicitly prevent players from transferring their accounts. For example, Epic Games states that "users *do not own* their accounts, and … transferring of accounts or access keys is prohibited".[617] EA provides that users shall not "sell, buy, trade or otherwise transfer

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615 R Kennedy, "Virtual Rights: Property in Online Game Objects and Characters" (2008) 17 *Information and Communications Technology Law* 95, 100.

616 Steam, "Subscriber agreement": https://store.steampowered.com/subscriber_agreement/.

617 Epic Games, "Terms of Service": https://www.epicgames.com/site/en-US/tos (emphasis added).

… [their] account, any personal access to EA services, or any EA content associated with [their] EA account", including through out-of-game transactions.[618]

7.57 The terms of the Steam community marketplace, allow some trading of "[licence] rights to virtual items" between players.[619] However, the trading of these licences is only possible in the context of a wider licence agreement to which the player is subject. We acknowledge that, in this limited sense, in-game digital assets may be considered to be divestible. It is important to note, however, that this divestibility is generated through a licence, which is not independent of persons nor of the legal system.

Conclusion on in-game digital assets

7.58 We provisionally conclude that in-game digital assets (as conceptualised above) do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. The main obstacle to in-game digital assets being data objects is the fact that any their existence relies solely on a proprietary ecosystem owned by game developers (or any affiliated parties). Access of users to this ecosystem is governed by licences, which usually restrict what players are able to do in relation to their account. This makes the existence of in-game digital assets dependent on the legal system.

Consultation Question 11.

7.59 We provisionally conclude that in-game digital assets do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. Do you agree?

7.60 Regardless of your answer to the above question, do you think that in-game digital assets should be capable of attracting personal property rights?

POTENTIAL AREAS OF FUTURE DEVELOPMENT

7.61 As we suggest above, in-game digital assets that are supplied solely through EULAs are structured in ways which fundamentally prevent them from satisfying our proposed criteria of data objects. Those in-game digital assets ultimately are reliant on a central counterparty party to imbue them with any object of property-like characteristics they may have.

7.62 However, academics and market participants have suggested that there are limitations to, or problems with, this model for online relationships with things of value. Some suggest that certain of these limitations could be addressed by moving towards a legal system that recognises more meaningful ownership (and other property rights) in digital assets, including in-game digital assets.

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618 Electronic Arts, "User Agreement": https://tos.ea.com/legalapp/WEBTERMS/US/en/PC/.

619 Steam, "Subscriber agreement": https://store.steampowered.com/subscriber_agreement/.

7.63 For example, Professor Fairfield argues that:[620]

> Much code is designed to act as a purely non-rivalrous resource. One person's use of the code does not impede another person from making use of it. Non-rivalrousness enables the creation and distribution of many perfect copies at nearly zero cost. ....
>
> But not all code is non-rivalrous. Rivalrousness, in the physical world, lets the owner exclude other people from using owned objects. We often desire the power to exclude in cyberspace too, and so we design that power into code.

7.64 We think that in the future, in-game digital assets will begin to test the boundaries of our proposed third category of personal property, and the boundaries of whether and how rights in respect of those assets are properly characterised as contractual or, alternatively, as data object-based.

7.65 Indeed, this is already happening. 2021 saw the development of various nascent initiatives to create participatory online environments which are based on the users' property rights in relation to data-objects (normally structured as non-fungible tokens ("NFTs")) which represent their in-game assets. For example, Yuga Labs launched Otherdeeds, which are simply NFTs linked to information (such as a picture) of on-line "land". However, the terms and conditions of the Otherdeeds NFT Purchase Agreement explicitly note that no physical items or external legal rights are linked to Otherdeeds:[621]

> Each Otherdeed is digital in nature and not linked to and is not sold together with (i) any items or representations that have physical dimensions such as mass or volume, or (ii) any Access Rights as of the time of purchase.

7.66 But the definition of "Access Rights" does envisage that certain rights might be linked to Otherdeeds in future:[622]

> Ownership of an Otherdeed may following the date hereof entitle the Purchaser to certain tangible or rights, benefits, interests, preferences or privileges herein offered from time to time by Animoca or third parties in their respective sole discretion.

7.67 This legal structuring shows a move away from a solely user-service provider relationship, to a relationship where certain access rights are granted in respect of (or linked to) a distinct object of property rights.

7.68 We expect that the legal structuring in this area will continue to evolve. For example, Kennedy envisions that proprietary protection for in-game digital asset users is inevitable, and justifiable on the basis of the players' labour and social production in the virtual environment.[623] Tying contractual access rights to a distinct object of

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620 J Fairfield, "Virtual property" (2005) 85 *Boston University Law Review* 1047, 1053.

621 See https://otherside.xyz/nft-purchase-agreement.

622 Above.

623 R Kennedy, "Virtual Rights: Property in Online Game Objects and Characters" (2008) 17 *Information and Communications Technology Law* 95 101.

property rights is a neat way to achieve this. The contractual access rights are likely to remain EULA-based (as discussed above). But the linked NFT — the distinct data object — could benefit from its greater composability, transferability, and potentially increased liquidity within the NFT markets. As contractual access rights related to that specific NFT are enhanced or modified (perhaps through users interacting with the game environment), the realisable market value of the linked NFT is likely to change to reflect the market's perceived value of those associated access rights. This enhanced composability allows for greater legal recognition of the ways in which market participants interact online. Professor Fairfield suggests ways in which this might happen:[624]

> Cyberspace is a descriptive term. It describes the degree to which some kinds of code act like spaces or objects. Taking this approach frees us to apply the developed body of property law to assist in solving inefficient allocations of rights on the internet. It also provides us with a useful tool for separating the intellectual property interest from the property interest in code. And finally, it provides a useful tool for restraining abuses of contract online.

7.69 Although legal structuring in this area remains at an early stage of development, we anticipate that the ability for market participants to use data objects in novel ways to help govern, or as part of wider, online relationships will become increasingly important. In particular, data objects might facilitate greater participation by users worldwide, the more efficient allocation to users of online resources that are considered valuable by market participants and online arrangements that have the potential to "fractionate existing power structures".[625] We consider that the law of England and Wales is well-placed to facilitate this experimentation, innovation and iterative development.

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624 J Fairfield, "Virtual property" (2005) 85 *Boston University Law Review* 1047, 1102.

625 See https://cobie.substack.com/p/wtf-is-web3.

Chapter 8: Domain names

INTRODUCTION

8.1 This chapter applies our criteria of our proposed third category of personal property — data objects — to domain names. We conclude that domain names, as currently structured and used by market participants, do not exhibit those criteria.

DOMAIN NAMES

8.2 Computers use internet protocol ("IP") addresses, designated by a unique 32-bit number[626] represented in dotted decimal form,[627] to locate specific pages on the internet and to enable communications between devices and networks.

8.3 For convenience and ease of use by humans, IP addresses are commonly expressed in the form of domain names, as a string of letters and/or numbers. The Domain Name System ("DNS") resolves (or translates) these domain names into IP addresses. For example, if an internet user enters the domain name "www.wikipedia.org.", the DNS resolves this query by directing them to the IP address 198.35.26.96.

8.4 Domain names can be broken down into multiple levels, separated by full stops. When read left to right, the final part of the name represents the top-level domain ("TLD").[628] For example, for "www.wikipedia.org.", the top-level domain is ".org".

8.5 The Internet Corporation for Assigned Names and Numbers ("ICANN") is responsible for administrating the allocation of TLDs to registries. For example, the not-for-profit company Nominet UK is currently responsible for administrating the ".uk", ".cymru" and ".wales" country code TLDs.[629] In turn, registries typically delegate the commercial sales of domain name registrations by end users ("registrants") to "registrars".

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626 Or, in the case of Internet Protocol Version 6 ("IPv6"), a 128-bit binary number address. In the interests of simplicity, this chapter will refer only to the (currently) more widely used Internet Protocol Version 4 ("IPv4"). See further: J Fruhlinger, "What is IPv6, and why is adoption taking so long?": https://www.networkworld.com/article/3254575/what-is-ipv6-and-why-aren-t-we-there-yet.html.

627 A string of decimal numbers, using the full stop as a separation character.

628 Note that the final full stop technically represents the "root zone." This is almost always left blank. Alternative DNS roots are also available, though they are not currently ordinarily used. They are not administered by the Internet Corporation for Assigned Names and Numbers ("ICANN"): NS1, "What is a DNS zone?": https://ns1.com/resources/dns-zones-explained. Examples include the Russian National DNS (НСДИ), started in 2019, designed to ensure the continued functioning of the Russian Internet in the event of its disconnection from the rest of the internet: BBC, "Russia 'successfully tests' its unplugged internet" (24 December 2019): https://www.bbc.co.uk/news/technology-50902496.

629 See: https://www.nominet.uk/uk-domains/. TLDs are commonly sub-divided into generic top-level domains ("gTDLs"), such as ".com" or ".org", and country code top-level domains ("ccTLDs"), such as ".uk".

8.6 Multiple servers help to process a DNS query — to help direct an input of a letter/number domain name to the correct IP address.[630] A "recursive resolver" functions as an intermediary. If the domain name has recently been requested by another client, this server may be able to provide the IP address from its cached (stored) data. If not, the server will send sequential requests to other servers (the "root nameserver",[631] the "TLD nameserver",[632] and then the "authoritative nameserver"[633]) to discover the IP address in question.

8.7 Domain names can be extremely valuable. For example, the domain "NFT.com" was purchased last year for US$2 million.[634] Persons wishing to acquire domain names must normally interact either with (accredited) registrars or with resellers who have already acquired the domain in question,[635] sometimes on a speculative basis.[636]

8.8 Registration details for domain names are kept in publicly accessible databases called WHOIS servers. These contain information about the registrar (for example, when the domain was registered and the registrar's name), the registrant, the expiry date of the domain, contact details, and the status of the domain.[637]

8.9 The registration of domain name is subject to the TLD Registries' Terms of Service.[638] For example, in the case of a ".uk" domain registered with Nominet, applicants agree, among other things, to:[639]

(1) Pay any relevant transaction fees due from time to time.

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630 Cloudflare, "DNS server types": https://www.cloudflare.com/en-gb/learning/dns/dns-server-types/.

631 The root nameserver responds to the recursive resolver's request by directing it to the appropriate TLD nameserver.

632 The TLD nameserver responds to the recursive resolver's request by providing it with the relevant authoritative nameserver.

633 The authoritative nameserver responds to the recursive resolver's request by providing provides the IP address of the domain name.

634 A Allemann, "NFT.com, purchased for $2 million, launches website," 15th March 2022: https://domainnamewire.com/2022/03/15/nft-com-purchased-for-2-million-launches-its-website/.

635 M G Bridge, G McMeel, L Gullifer, K F K Low, *The Law of Personal Property* (3rd ed 2021) para 8-035.

636 See S Sunderland, "Domain Name Speculation: Are We Playing Whac-a-Mole" (2010) 25 *Berkeley Technology Law Journal* 465.

637 M Jeftovic, *Managing Mission – Critical Domains and DNS: Demystifying Nameservers, DNS and Domain Names* (2018) pp 13–14.

638 As noted above, registration is typically conducted by a registrar on behalf of the registrant. In this scenario, a tri-partite contractual relationship arises. A registrant enters two separate contracts: one with Nominet, and one with the ISP / registrar. The registrar then enters into a further contract with Nominet. See further: D Osborne and Steve Palmer, "United Kingdom ('.uk')" in *Domain Name Law and Practice and International Handbook* (T Bettinger and A Waddell, eds) p 952.

639 Nominet, *Terms and Conditions of Domain Name Registration* (24 April 2020): https://nominet.uk/wp-content/uploads/2020/04/Terms-and-Conditions-of-Domain-Name-Registration-24-04-2020-v1.pdf?_ga=2.67862290.2095671935.1651051644-1929600681.1651051644.

(2) Give and keep the registrar notified of their correct name, postal address, phone and email contact information. This includes responding quickly to any request to confirm or correct the information on the register.

(3) Notify the registrar promptly about any legal proceedings involving their domain name.

8.10 All registry operators' Terms of Service incorporate provisions in which registrants agree to abide by ICANN's Uniform Domain Dispute Resolution Policy. Proceedings can be brought before an authorised Dispute Resolution Provider[640] by a complainant who can show that:[641]

(1) A domain name is identical or confusingly similar to their trade mark.

(2) The respondent has no legitimate interests in the domain name.

(3) The domain has been registered and/or is being used in bad faith.

8.11 There is no inbuilt transfer mechanism for domain names. Instead, the process must be carried out by the relevant registrar. For example, in the case of ".uk" domain names operated by Nominet, their terms and conditions provide that:[642]

> If you do not transfer your domain name in accordance with our published transfer process there will be no valid transfer of your domain name, and no document or agreement attempting or claiming to transfer your domain name will have any effect.

8.12 ICCAN has also established an Inter-Registrars Transfer Policy, which sets out the only permissible grounds upon which the current registrar can deny the transfer of a domain name to another registrar. These reasons include evidence of fraud, lack of consent by the current registrant, lack of payment for the previous registration period, and an order by a court of competent jurisdiction.[643]

Existing case law on domain names

8.13 Several jurisdictions, including England and Wales, have now recognised that domain names might constitute intangible property. For example:

(1) In the English House of Lords decision in *OBG v Allan*, Lord Hoffman stated that "I have no difficulty with the proposition that a domain name may be

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640 Such as the World Intellectual Property Rights Organisation.

641 M Jeftovic, *Managing Mission – Critical Domains and DNS: Demystifying Nameservers, DNS and Domain Names* (2018) p 54.

642 Nominet, *Terms and Conditions of Domain Name Registration* (24 April 2020), clause 11.4: https://nominet.uk/wp-content/uploads/2020/04/Terms-and-Conditions-of-Domain-Name-Registration-24-04-2020-v1.pdf?_ga=2.67862290.2095671935.1651051644-1929600681.1651051644.

643 M Jeftovic, *Managing Mission – Critical Domains and DNS: Demystifying Nameservers, DNS and Domain Names* (2018) p 60.

intangible property, like a copyright or trade mark", although he doubted that they could be the subject of an action in conversion.[644]

(2) In *Kremen v Cohen,* the United States Court of Appeals (9th Circuit) held that a domain name is:[645]

> intangible property because it satisfies a three-part test for the existence of a property right: it is an interest capable of precise definition; it is capable of exclusive possession or control; and it is capable of giving rise to a legitimate claim for exclusivity.

(3) In *Tucows v Renner,*[646] the Ontario Court of Appeal held that a domain name could be regarded as intangible personal property in the context of a jurisdictional dispute.[647] The Court accepted the proposition that a property model best captured the way in which market participants interacted with domain names,[648] and that they met the *Ainsworth* criteria for property.[649]

8.14 Nonetheless, there is also conflicting case law, in which other courts have doubted the proprietary status of domain names. For example, in *Network Solution Inc. v Umbro International*,[650] the Supreme Court of Virginia stated that:[651]

> [A] domain name registrant acquires the contractual right to use a unique domain name for a specified period of time. However, that contractual right is inextricably bound to the domain name services that [the registrar] provides. In other words, whatever contractual rights the judgment debtor has in the domain names at issue in this appeal, those rights do not exist separate and apart from [the registrar's]

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644 [2007] UKHL 21, [2007] 2 WLR 920 at [101].

645 *OBG v Allan* [2007] UKHL 21, [2007] 2 WLR 920, at [50], citing *Kremen v Cohen*, 337 F.3d 1024 (9th Cir. 2003) (United States Court of Appeals) at 1030. In *Kremen v Cohen*, the Court noted (at 1029]) that the defendant "all but concedes" that "registrants have property rights in their domain names," reflecting "its positions in prior litigation." The Court stated (at 1034) that it was unnecessary to "delve too far into the mechanics of the Internet to resolve the case."

646 2011 ONCA 548 (Ontario Court of Appeal).

647 The decision was endorsed by the English High Court in *Hanger Holdings v Perlake* [2021] EWHC 81 (Ch), [2021] Bus LR 544, by Mr Justice Hacon.

648 2011 ONCA 548 (Ontario Court of Appeal), at [52], quoting J D Lipton, "Bad Faith in Cyberspace: Grounding Domain Name Theory in Trademark, Property, and Restitution" (2010) 23 *Harvard Journal of Law & Technology* 447.

649 Discussed in more detail at para 2.37.

650 259 VA. 759, 529 S.E.2d 80 (2000) (Justice Kinser).

651 In *CRS Recovery, Inc. v Laxon*, 600 F.3d 1138 (9th Cir. 2010) (United States Court of Appeals), the Court adopted a "narrow" reading of *Umbro International* on the basis that the decision "did not disapprove of the characterisation of domain names as property rights, but treated it as immaterial" to determining whether a third-party debt order could be made. It also cited an article by G Vona, *Sex in the Courts: Kremen v Cohen and the Emergence of Property Rights in Domain Names,* (2006) 19(2) Intellectual Property Journal 393, to the effect that "the decision is quite ambiguous."

Nonetheless, the Court stated that it "did not believe that it is essential to the outcome of this case" to resolve whether domain names amounted to property. As in *Kremen v Cohen*, the defendant registrar, Network Solutions Incorporated, purported to acknowledge "during oral argument…that the right to use a domain name is a form of intangible personal property."

services that make the domain names operational Internet addresses. Therefore, we conclude that "a domain name registration is the product of a contract for services between the registrar and registrant."

8.15 To date, domain name disputes in the United Kingdom have tended to revolve around the law of trade marks.[652] In the past, successful claimants have obtained court orders compelling the defendant to take steps to have the relevant registration authority transfer control over the infringing domain name.[653]

8.16 We note that some TLD's terms and conditions state that "a domain name is not an item of property and has no 'owner.'"[654] In our view, however, such terms should not themselves be regarded as determinative of whether an object is capable of attracting property rights.[655]

APPLICATION OF OUR CRITERIA TO DOMAIN NAMES

Data represented in an electronic medium

8.17 Domain names meet our first criterion, in that they are composed of distinct data represented in an electronic medium, including in the form of computer code, electronic, digital, or analogue signals. As noted above, domain names are an alphanumeric alias, which — through the DNS protocol — is associated with an IP address composed of a unique 32-bit number represented in dotted decimal form.

Independent existence

Existence independent of persons

8.18 We consider that, on the description above, domain names exist independently of persons. The alphanumeric alias itself can be separated from a person and does not require a person for its continued existence.

Existence independent of the legal system

8.19 In our view, domain names do not exist independently of the legal system. This is broadly for the reasons given by the Supreme Court of Virginia in *Network Solution*

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652 See eg: *British Telecommunications Plc v One in a Million* [1999] 1 WLR 903; *IBM v Web-Sphere Ltd* [2004] EWHC 529 (Ch); *Phones4U Ltd v Phone4u.co.uk Internet Ltd* [2006] EWCA Civ 244, [2007] RPC 5; *Musical Fidelity Ltd v David Vickers (t/a Vickers Hi-Fi)* [2002] EWCA Civ 1989.

653 *British Telecommunications Plc v One in a Million* [1999] 1 WLR 903.

654 See, for example, Nominet, *Terms and Conditions of Domain Name Registration* (24 April 2020), clause 7.1: https://nominet.uk/wp-content/uploads/2020/04/Terms-and-Conditions-of-Domain-Name-Registration-24-04-2020-v1.pdf?_ga=2.67862290.2095671935.1651051644-1929600681.1651051644.

655 See, by analogy (albeit in the context of real property), Lord Templeman in *Street v Mountford* [1985] A.C. 809 at 819: "Both parties enjoyed freedom to contract or not to contract and both parties exercised that freedom by contracting on the terms set forth in the written agreement and on no other terms. But the consequences in law of the agreement, once concluded, can only be determined by consideration of the effect of the agreement. If the agreement satisfied all the requirements of a tenancy, then the agreement produced a tenancy and the parties cannot alter the effect of the agreement by insisting that they only created a licence. The manufacture of a five-pronged implement for manual digging results in a fork even if the manufacturer, unfamiliar with the English language, insists that he intended to make and has made a spade."

Inc. v Umbro International.[656] The functional characteristics of a domain name are entirely reliant on the services provided by registries. It is these services which provide the essential association between domain names and their corresponding IP address. In the absence of this link, domain names would be pure information: nothing more than a string of letters and numbers, separated by full-stops.

8.20 A registrant's (conditional and time limited) rights to the exclusive association of the registered domain name with a specified IP address cannot be disassociated from these services which help to make the domain name operational. It follows that domain names are not independent of the legal system, as they are dependent on the contractual obligations between the registrant and the registry.[657]

Rivalrousness

8.21 Domain names can be regarded as rivalrous. It is possible for the registered owner of a domain name to prevent others from using the same domain name. This is built into the architecture of domain names and the DNS. A given domain name can only be "resolved" to one IP address, leading to the website specified by registrant. This makes it impossible for another person to use the same address. In other words, the use or consumption of a domain name necessarily prejudices the use or consumption of that domain by others: domain names are rivalrous by design.

8.22 We do not think this conclusion is affected by the possibility that the current DNS could be substituted by a new protocol, in which the registrant would no longer have a claim to the same domain.[658] This would not affect the rivalrousness nature of the initial object itself. Even if the initial DNS were destroyed, a thing may still attract property rights notwithstanding the fact that it is possible to destroy it. It needs only to have "some degree of permanence or stability".[659] In *Ruscoe v Cryptopia*, Justice Gendall said that even assets which may have little permanence can be objects of property rights, referring to the example of a ticket to a football match.[660]

Divestibility

8.23 Domain names are divestible. They can be transferred from one person to another. Once a person transfers their domain name, they no longer have any connection to it. It is fully separated from the initial owner and fully transferred to the new owner. Registrants are, however, dependent on the actions of their registrar to divest themselves of the domain name (or to transfer their registration to another registrar). We think that this reinforces our argument that domain names are not independent of persons (and, by extension, of the legal system). As the authors of *The Law of*

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656 259 VA 759, 529 S.E.2d 80 (2000).

657 This argument might also provide an additional reason as to why email accounts, discussed further in Chapter 7, are not independent of persons and therefore fall outside our proposed third category.

658 M G Bridge, G McMeel, L Gullifer, K F K Low, *The Law of Personal Property* (3rd ed 2021) para 8-038.

659 *National Provincial Bank v Ainsworth* [1965] AC 1175 at 1247–1248.

660 *Ruscoe v Cryptopia Ltd (in liq)* [2020] NZHC 728, (2020) 22 ITELR 925 at [117]. As noted in Chapter 2 from para 2.58, we think that this is an imperfect example. While the functionality of the ticket has a short life, the ticket (as a physical object) could potentially have a longer life (eg if it is kept as a souvenir). It is not always the case that a ticket is destroyed after use. We agree, however, that its potentially short life does not preclude it from being an object of property rights.

Personal Property point out, "although one may loosely speak of transferring domain names, the process is probably more accurately one of contractual novation" in which the transferee enters into fresh contract(s) with the registrar (and the registry).[661]

Conclusion

8.24 For the reasons given above, we provisionally conclude that domain names do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. While they are constituted of distinct data recorded in an electronic medium, are rivalrous, and divestible on transfer, we think that they are not (in the way they are implemented today) sufficiently independent of the legal system.

8.25 The position might, however, be otherwise for domains implemented pursuant to other protocols or systems, such as the Ethereum Name Service ("ENS"), which has a "significantly different architecture due to the capabilities and constraints provided by the Ethereum blockchain."[662] In particular, ENS registrars are decentralised, using smart contracts deployed on the Ethereum system, which record a list of domains and their owners — ENS domains are likely crypto-tokens within the description discussed in detail in Chapter 10. For this reason, ENS domains are likely to be sufficiently independent of the legal system to fall within our third category of personal property.[663]

Consultation Question 12.

8.26 We provisionally conclude that (DNS) domain names do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. Do you agree?

8.27 Regardless of your answer to the above question, do you think that (DNS) domain names should be capable of attracting personal property rights?

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661 M G Bridge, G McMeel, L Gullifer, K F K Low, *The Law of Personal Property* (3rd ed 2021) para 8-038. As we discuss in Chapter 12, the transfer of some crypto-tokens involves a state change in which the existing token is replaced by a new, modified, or causally-related crypto-token associated with a data-set that persists through the transaction. As we suggest in Chapter 13, this process can be regarded as analogous to — but not exactly the same as — novation.

662 ENS Documentation, "Introduction": https://docs.ens.domains/.

663 Above.

Chapter 9: Carbon emissions trading schemes

INTRODUCTION

9.1 In this chapter, we test certain examples of digital assets within carbon emissions trading schemes against the criteria of our proposed third category of personal property — data objects — that we describe in Chapter 5. We discuss various types of carbon emissions trading schemes. Although we do not discuss them directly, we consider that our analysis in this chapter might also apply to other similar intangibles/digital assets, such as waste management licences or milk quotas.

9.2 As we discuss in Chapter 4,[664] these intangible things raise questions as to whether they fall within either of the two traditionally recognised categories of personal property. They are intangible and so not capable of being things in possession, but they might also be more difficult to characterise as a thing in action than something like a debt. We think that whether these intangible things fall within our third category of personal property depends on the structure of the instrument — the thing itself.

9.3 In this chapter, we intentionally frame our analysis in broad, category-based terms. That means that a particular digital asset might exhibit the requisite characteristics of data objects and fall within our proposed third category of personal property, notwithstanding the fact that other digital assets of this type do not qualify for inclusion.

9.4 Moreover, even if a given intangible/digital asset does not itself meet the criteria of our third category of personal property, it would still be possible to link it to a data object, such as a crypto-token.[665] We expect that this practice will become more common over time and we discuss it in detail in Chapter 14.

STATUTORY CARBON EMISSIONS ALLOWANCES

Statutory carbon emissions allowances as things

9.5 Carbon emission allowances ("CEAs") are issued pursuant to a mandatory statutory scheme designed to encourage certain market participants to reduce the emissions released into the atmosphere annually, on a net basis. The current scheme applicable in England and Wales is the United Kingdom Emissions Trading System ("ETS").[666] This regime is separate from the Voluntary Carbon Credits ("VCCs") regime, discussed below.

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664 See, in particular, from para 4.39.

665 For example, see the "Toucan protocol" (https://toucan.earth/.) and the "Regen Network" (https://www.regen.network/.). See further: A Kersley, "A crypto company thinks it can help fight climate change" (17 February 2022): https://www.wired.co.uk/article/toucon-crypto-carbon-credits.

666 Department for Business, Energy and Industrial Strategy, "Guidance: Participating in the UK ETS" (updated 10th February 2022): https://www.gov.uk/government/publications/participating-in-the-uk-ets/participating-in-the-uk-ets.

9.6 CEAs are created under a statutory scheme, which follows a "cap and trade" model. Each year, a cap is set on the total amount of emissions for businesses ("operators") engaged in the commercial sectors (aviation, power generation, and other energy intensive industries)[667] covered by the scheme. The intention is to continue decreasing the cap on a yearly basis. Within this cap, operators receive certain allowances. Each year, operators must surrender allowances in accordance with their greenhouse gas emissions permit.[668] If an operator fails to surrender sufficient allowances, the designated regulatory authority ("ETS Regulator")[669] may impose a (monetary) civil penalty.[670]

9.7 Participants in the scheme can trade allowances between themselves to cover their annual emissions. If a participant has a surplus of CEAs, it can sell them on the market. CEAs are dematerialised, being documented on an electronic register.[671]

9.8 As noted in Chapter 4, the case of *Armstrong v Winnington* confirms that CEAs issued under mandatory schemes are intangible property under the law of England and Wales,[672] albeit not a thing in action "in the narrow sense" of claim rights.[673]

9.9 The reasoning of the Court in *Armstrong v Winnington* focused closely on the existence of a statutory regime in respect of this type of instrument. In the words of Mr Stephen Morris QC (sitting as a Deputy High Court Judge):[674]

> First, there is, here, a statutory framework which confers an entitlement on the holder of an [European Union Allowance ("EUA")] to exemption from a fine. Secondly, the EUA is an exemption which is transferable, and expressly so, under the statutory framework. Thirdly the EUA is an exemption which has value […].

9.10 In relation to the value of an EUA, the Judge said the following:[675]

> It has economic value, first because it can be used to avoid a fine, and secondly, because there is an active market for trade in EUAs. The evidence before me

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667 Schs 1 and 2 Greenhouse Gas Emissions Trading Scheme Order 2020/1265.

668 Art 2 Greenhouse Gas Emissions Trading Scheme Order 2020/1265.

669 See arts 10 to 14 Greenhouse Gas Emissions Trading Scheme Order 2020/1265. The competent Regulatory Authority is determined either by reference to the location of the relevant installation (eg factory) or, in the case of aviation, the place in which the business is registered. The ETS Regulator for England is the Environment Agency. In Wales, it is Natural Resources Wales.

670 See ch 2 Greenhouse Gas Emissions Trading Scheme Order 2020/1265. For example, the "excess emissions penalty" (art 52(2)) is set at £100 (multiplied by the inflation factor) for each allowance that the operator fails to surrender. Additional civil penalties may be imposed on operators who fail to comply (on time) with the requirements of an enforcement notice, issued by the regulator (art 65).

671 Art 18(3) Greenhouse Gas Emissions Trading Scheme Order 2020/1265.

672 It was common ground between the parties that the allowances in question gave rise to a "property right of some sort": *Armstrong v Winnington* [2012] EWHC 10 (Ch), [2013] Ch 156 at [31].

673 *Armstrong v Winnington* [2012] EWHC 10 (Ch), [2013] Ch 156 at [61].

674 Above at [58].

675 Above at [49].

establishes that substantial amounts of money change hands between a transferor and a transferee.

9.11 A similar analysis was adopted by the United States Inland Revenue Service in a ruling requested by a taxpayer regarding the tax consequences of the sale of surplus EUAs:[676]

> In this case, [holding] of [CEAs] is necessary to operate in [the relevant industry]. Emissions units per member state are decided by a governing authority and reflected in an allocation of allowances to that member state. The allowances are distributed by each member state to businesses operating in the regulated industries within its borders.
>
> Because each allowance permits the holder to engage in a business activity otherwise unlawful, without penalty, the allocation of an allowance by a member state is the granting of an intangible property right to each business to emit CO2 to a set limit. The value of the allowance is independent of the performance of services by any individual. Thus, for [tax purposes] the allowances are intangible property...

9.12 *Armstrong v Winnington* refers only to EUAs issued under the European mandatory scheme. Nonetheless, the European mandatory scheme functions in the same way as the domestic one. Therefore, we consider that this reasoning would apply equally, by analogy, to UK CEAs.[677]

9.13 Lastly, especially in the United States, there has been some concern that granting full property rights to emissions allowances might "restrict the Government's ability to adjust emissions targets," because it "could trigger Government compensation requirements under the US Constitution's 'takings clause.'"[678] Consequently, the United States' Clean Air Act defines allowances as "limited authorisation[s] to emit certain levels of [pollutants]," and expressly provides that nothing under the act or US law shall be construed to limit the Government's authority to "terminate or limit" the authorisations.[679]

9.14 Overall, therefore, a CEA is an emissions allowance that is constituted by legislation and that operates as a reification of a statutory entitlement to exemption from a fine. It is a statutorily created thing that can be deployed by operators to provide a "permit" for conduct (producing carbon emissions) which would otherwise be prohibited. Alternatively, CEAs can be conceptualised as providing a "shield" from the fine which

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676 Internal Revenue Service, "Department of the Treasury, Private Letter" 200825009 (20 June 2008). https://www.irs.gov/pub/irs-wd/0825009.pdf.

677 See also M Ryan, J Bailey, "Carbon credits under the UK Emissions Trading Scheme" (2022) 1 *Journal of International Banking and Financial Law* 27.

678 K LaMotte, D Williamson and L Hopkins, "Emissions Trading in the US: Legal issues", in D Freestone and C Streck, *Legal Aspects of Carbon Trading: Kyoto, Copenhagen, and beyond* (2009) p 397

679 Clean Air Act (42 USC §7651b), s 403(f). An early draft proposal of the EU scheme defined an "allowance" as an "administrative authorisation," replicating the US model. This definition was, however, rejected due to a perceived conflict with the principle of subsidiarity. Instead, each Member State was left to regulate CEAs according to their own national legal regimes: see M Pohlmann, "The European Union Emissions Trading Scheme" in D Freestone and C Streck, *Legal Aspects of Carbon Trading: Kyoto, Copenhagen, and beyond* (2009).

would otherwise be imposed. To avoid a fine, operators must surrender a specified quantity of these statutorily created things each year.

APPLICATION OF OUR CRITERIA TO CEAS

Data represented in an electronic medium

9.15 If a CEA is constituted of data represented in an electronic medium, including in the form of computer code, electronic, digital, or analogue signals, we think it is possible that they could satisfy our first criterion. However, an alternative argument is that although individual CEAs might be associated with data (such as a unique serial number) any such data is merely a record of the thing in question. As we discuss in Chapter 6 at paragraph 6.65 it is extremely important in the digital world to maintain a distinction between a digital record and any property right that it records.

9.16 As noted above, we think that CEAs are best characterised as a statutorily-created thing which can be deployed ("surrendered") to avoid the imposition of a fine. This entitlement can be *recorded* by data, but it does not depend on that data in any way itself — the data are not a constituent part of the thing.[680] The thing in question is instead a statutory reification of a permission. This is similar to our conception of a property right created by intellectual property statutes as a standalone "thing" in itself (see Chapter 3 at paragraph 3.52 for more detail).

Independent existence

Existence independent of persons

9.17 We think that CEAs can be characterised as independent of persons. A contrary position is however, presented by Professors Low and Lin. Commenting on the decision in *Armstrong v Winnington,* they suggest that CEAs have "limited, rather than universal, exigibility" on the basis that "an EUA only protects its holder from fines imposed by Member States participating in the [scheme]."[681]

9.18 We agree that the economic value of CEAs ultimately is derived from their ability to be deployed as an exemption from the imposition of a fine, and that their utility is specific to a holder. However, a CEA can also be acquired and held by parties outside the scheme (for example, for investment or trading purposes on the secondary market). Therefore, although the exemption or immunity that a CEA confers can only be used personally by operators as a defence to a fine from an ETS Regulator, that does not mean that they are reliant on the operator for their continued existence.[682] An operator can still acquire a permission, or "shield", even if that shield does not protect them from anything or anyone (for example, even if the operator has a surplus of CEAs and so cannot use the CEA as a permission).

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680 M G Bridge, L Gullifer, K F Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-031.

681 K Low and J Lin, "Carbon Credits as EU Like It: Property, Immunity, TragiCO_2medy" (2015) *Journal of Environmental Law* 377.

682 See, for example, art 16(1)(b) and (c) Greenhouse Gas Emissions Trading Scheme Auctioning Regulations (SI 2021/484), which list certain "investment firms" and "credit institutions" as "Persons eligible to apply for admission to bid" directly in auctions.

Existence independent of the legal system

9.19 However, CEAs do not have an existence independent of the legal system. Much like intellectual property rights (discussed further in Chapter 3), they are entirely dependent on legislation for both their continued existence and their function. For example, in the absence of the statutory scheme, there would be no mechanism to create (reify) or allocate new CEAs. In any event, the allowances would also become entirely meaningless, as there would no longer be a fine imposed on operators with insufficient allowances to cover their yearly emissions, and no ETS Regulator with the statutory authority to issue a fine. It follows that there would be no conceivable reason to hold or acquire CEAs (even if this were still possible).

Rivalrousness and divestibility

9.20 For this reason, we conclude that CEAs fall outside our third category of personal property, notwithstanding the fact that they meet our other criteria:

(1) CEAs have the quality of rivalrousness. Each CEA is unique and uniquely associated with one holder, by virtue of the applicable statutory regime. In particular, the effect of the statutory regime is that the use or consumption of a CEA by one person necessarily prejudices the use or consumption of that same CEA by another.

(2) CEAs are also divestible. The transferor is fully deprived of the CEA on transfer, and the transferee has the same relationship to the thing as the previous owner.

Conclusion on statutory CEAs

9.21 We provisionally conclude that CEAs do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. They are more appropriately regarded as a form of statutory property and are most analogous to certain types of intellectual property rights which we discuss in Chapter 3.

Consultation Question 13.

9.22 We provisionally conclude that Carbon Emissions Allowances do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. Do you agree?

VOLUNTARY CARBON CREDITS

9.23 Alongside CEAs, there also exist voluntary markets, on which persons can purchase voluntary carbon credits ("VCCs"). The underlying purpose of VCCs is for organisations or persons collectively to incentivise the reduction of global emissions by funding emissions reductions schemes. Those who choose to participate in the voluntary carbon markets can "offset" their own emissions by purchasing VCCs which evidence that investment has been made or action has been taken in projects aimed at reducing atmospheric greenhouse gas.

9.24 VCCs are created pursuant to self-regulatory programs. Bodies known as "carbon standards"[683] certify projects aimed at reducing emissions to ensure that they conform to set standards. Once approved, a project is issued a VCC for each tonne of carbon dioxide which it reduces or removes from the atmosphere. The project developers can then trade those certificates on the market.[684]

9.25 The VCC operates like a certificate or token — it simply evidences that a tonne of carbon dioxide has been removed from the atmosphere. The VCC, of itself, has no value (although market participants may decide to attribute value to it).

9.26 The most obvious difference between VCCs and CEAs is that there is no legal framework regulating creating, allocating, and/or mandating the acquisition of VCCs. In particular, there is no legal obligation on commercial entities to participate in the schemes (although some mandatory regimes do recognise certain VCCs for compliance purposes).[685]

9.27 Further, unlike allowances issued pursuant to the ETS, VCCs are not homogenous. There are significant variances as to the type of offsetting project undertaken, geographical location, traceability, and the methodology used to calculate the amount of carbon offset. For example, projects in renewable energy or energy efficiency are considered more reliable (but are generally more expensive) than forestry projects.[686]

9.28 The proprietary status of VCCs has not yet been directly considered by the courts of England and Wales. As noted by The International Swaps and Derivatives Association ("ISDA"), the Court's discussion of CEAs in *Armstrong v Winnington* "was focused on the existence of a statutory regime to draw parallels with [existing caselaw on] milk quotas, which may allow it to be distinguished."[687]

9.29 Nonetheless, "the prevailing view" in most jurisdictions (including under the law of England and Wales), is that VCCs are "a form of intangible property."[688] On this analysis, a VCC represents the holder's right to certification that it has indirectly removed or reduced a tonne of carbon dioxide equivalent from the atmosphere. As ISDA argues:[689]

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683 See eg EcoCart, "Major Carbon Standards" (24 June 2021): https://ecocart.io/posts/major-carbon-standards.

684 International Swaps and Derivatives Association, *Legal Implications of Voluntary Carbon Credits* (2021) Annex I p 26.

685 International Swaps and Derivatives Association, *Legal Implications of Voluntary Carbon Credits* (2021) Annex I pp 26 to 27.

686 A Brohé, N Eyre, N Howarth, *Carbon Markets: An International Business Guide* (2009) p 274.

687 International Swaps and Derivatives Association, *Legal Implications of Voluntary Carbon Credits* (2021) p 13.

688 International Swaps and Derivatives Association, *Legal Implications of Voluntary Carbon Credits* (2021) p 13. They subsequently acknowledge, however, that "notwithstanding the flexibility of English law, pending an authoritative statement, there is currently a degree of perceived or residual uncertainty over the characterisation of VCCs."

689 International Swaps and Derivatives Association, *Legal Implications of Voluntary Carbon Credits* (2021) pp 9 to 10.

> VCCs can be seen as representing exclusive access to a finite resource — namely, certification that the holder either directly or indirectly has reduced or removed from the atmosphere one metric ton of carbon dioxide equivalent (tCO2e) in line with relevant rules and requirements. This view is consistent with the perceived market value of VCCs, which is associated with the holder's ability to claim some level of responsibility (through the retirement or cancellation of the credit) for a finite quantity of tCO2e reduction or removal arising from a finite set of certified projects. Value ultimately derives from the finite nature of the resources represented by VCCs, which includes the independent verification of such claims, as set out in the relevant carbon standards framework. In that sense, VCCs can be viewed as an intangible asset, evidenced by the register entries and established in accordance with the relevant carbon standard and registry rules. A VCC is a representation of the holder's right to the certification that it has indirectly reduced or removed a tonne of carbon dioxide equivalent from the atmosphere.

Alternative analysis: VCCs as a bundle of contractual rights

9.30 There is an alternative way in which VCCs could be structured. It would be possible to create VCCs consisting of "a bundle of private law contractual rights (and potentially tortious claims) against the project developer, verifier, carbon standard and registrar," for example, to ensure that the activities carried out have resulted in the emissions reductions claimed.[690]

9.31 There might be some advantages to structuring VCCs in this way (for example, by conferring holders with direct powers to ensure that projects are completed to specification). However, a key disadvantage is that it would be likely to impede the ease with which they can be traded or transferred:[691]

> Both the governing law and the terms of a contract will determine how the contract can be transferred. Under English law, a contractual right (as a thing in action) can only be transferred by assignment or novation, both of which require certain formalities to be complied with. For example, all three parties must agree to a novation and a legal assignment requires notice to be given to the obligor.

9.32 For this reason, we think it is more likely that most VCCs will be structured as a certification, rather than a bundle of private law rights. In any event, VCCs structured in the latter way would fall outside our proposed third category of personal property, on the basis that they would not be independent of the legal system. The remainder of this chapter applies our analysis to VCCs structured as a certification.

APPLICATION OF OUR CRITERIA TO VCCS

Data represented in an electronic medium

9.33 VCCs are composed of distinct units of data, for example, comprising a unique reference or serial number associated with a particular project and represented in an electronic medium, including in the form of computer code, electronic, digital, or

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690 International Swaps and Derivatives Association, *Legal Implications of Voluntary Carbon Credits* (2021) p 10.

691 Above p 11.

analogue signals. In contrast to CEAs, discussed above, we consider that that this record can properly be regarded as constitutive of the VCC, rather than a mere digital record of some other (statutorily reified) right(s). This is because any meaning imputed to a VCC is given by market participants to the specific data which constitute the VCC, and that meaning is not derived from an external piece of legislation.

Independent existence

Existence independent of persons

9.34 We consider that, on the description above, and for similar reasons to those put forward in relation to CEAs, VCCs can be said to exist independently of persons.

Existence independent of the legal system

9.35 VCCs are independent of the legal system. They do not depend on statutory recognition for their (continued) existence and would, for example, even continue to exist in the face of a statute prohibiting the trade of VCCs (although such a statute might affect their market value).

9.36 However, we consider that if or where VCCs are structured as a bundle of private law rights, then they would be dependent on legal obligations owed by particular persons, such as project developers. They would therefore not exist independently of the legal system.

Rivalrousness

9.37 This is perhaps the most challenging criterion for VCCs, at present, to satisfy. The rivalrousness of typical VCCs currently derives entirely from the systems devised and operated by registries.[692] They can be used to track VCCs (using their unique serial number) to identify their current owner, associated project, and whether they have been "retired" or "spent". Their purpose is to ensure that VCCs cannot, for example, be used by multiple companies purporting to offset their emissions using the same credit. Depending on their implementation, we think that these existing systems might be sufficiently rivalrous (by design) to fall within our third category of personal property. This determination would, however, need to be made on a case-by-case basis.

9.38 Dr Brohé, Professor Eyre, and Dr Howarth caution that:[693]

> Multiple sales of the same credit [are] a risk in carbon offsetting. Once a credit has been sold to a customer it should be cancelled…. To overcome this problem, many operators have their own registers…. Ultimately it may be desirable for sellers of credits to join a common registry in order to guarantee the cancellation of sold credits and avoid the risk of fraud and double-issuing.

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692 For example, the "American Carbon Registry" (https://americancarbonregistry.org/.), the "Gold Standard Registry" (https://www.goldstandard.org/resources/impact-registry.), the "Climate Action Reserve" (https://www.climateactionreserve.org/.), the "Social Carbon Registry" (http://www.socialcarbon.org/developers/registry/.), and the "Verified Carbon Standard Registry" (https://verra.org/project/vcs-program/.).

693 A Brohé, N Eyre, N Howarth, *Carbon Markets: An International Business Guide* (2009) p 281.

9.39 We think that it is important to distinguish "double-issuing" from "double-spending". The former term refers to the practice of issuing multiple credits in relation to the same emissions reduction, thereby artificially (and impermissibly) inflating the total number of VCCs associated with a given project. Although double-issuing may diminish the value of affected VCCs, it does not render them non-rivalrous (for example, they are still likely to have a unique serial number). The position would be otherwise, however, if the design of the registry permitted, say, a single VCC to be reclaimed multiple times by different users.

9.40 The more difficult question is whether a loose, voluntary framework that is enforced through the social agreement and co-operation of participants[694] is enough to say with certainty that the VCCs in question are rivalrous. At this stage our tentative conclusion is that VCCs are unlikely to satisfy this criterion.

9.41 Nevertheless, we think that some types of VCC could satisfy this criterion, provided that the design of the registry system renders the VCCs in question sufficiently rivalrous. The most likely way in which a VCC could satisfy our criteria was if it was constituted by some form of crypto-token system (see Chapter 14), or some private system analogous to the systems required under our proposed electronic trade documents bill.[695]

9.42 In addition, even if a particular VCC do not itself satisfy our criterion, it will still be possible to link that VCC to a crypto-token or other data object. We discuss this in more detail in Chapter 14. One benefit of this structure is that the linked VCC might then be able to achieve enhanced transferability and liquidity within the market.[696]

Divestibility

9.43 Irrespective of how they are structured, we think that VCCs are in general likely to be divestible. Registries are typically designed so as to ensure that the transferor is fully deprived of the instrument on transfer, and that the transferee has the same relationship to the thing as the previous owner.

Conclusion on VCCs

9.44 We provisionally conclude that most VCCs do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. This is because we provisionally conclude that most VCCs will not satisfy our criterion of rivalrousness. However, we consider that some VCCs could satisfy our proposed criteria, particularly if they were structured on the basis of a crypto-token or similar system. Indeed, we understand that many VCCs are already either being structured in this way, or are being linked to data objects such as crypto-tokens.[697]

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694 As opposed to, for example, cryptographic authentication through computational or computing means within an agreed set of protocol rules.

695 See Electronic Trade Documents (2022) Law Com No 405.

696 For example, see the "Toucan protocol" (https://toucan.earth/.) and the "Regen Network" (https://www.regen.network/.). See further: A Kersley, "A crypto company thinks it can help fight climate change", (17 February 2022): https://www.wired.co.uk/article/toucon-crypto-carbon-credits.

697 See n 696 above.

Consultation Question 14.

9.45 We provisionally conclude that most VCCs do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. Do you agree?

9.46 Regardless of your answer to the above question, do you think that VCCs should be capable of attracting personal property rights?

Chapter 10: Crypto-tokens

INTRODUCTION

10.1 Crypto-tokens are an important sub-set of digital assets.[698]

10.2 This chapter describes a crypto-token as a thing that can be treated as an object of property rights at law. It suggests that the defining features of crypto-tokens distinguish them both from other digital assets that do not satisfy the criteria set out in Chapter 5 and from pure information. It then considers whether crypto-tokens themselves exhibit the Chapter 5 criteria. We provisionally conclude that crypto-tokens do, in general, satisfy our proposed criteria of data objects and therefore that they fall within our proposed third category of personal property.

Terminology

10.3 Having described crypto-tokens in this chapter, in Appendix 4 we suggest a tentative short-form description for the term crypto-token, along with accompanying commentary. We do not intend this description to be either exhaustive or determinative.[699] Nevertheless, we use this description as a reference point to inform our use of the term crypto-token in the rest of this consultation paper. More widely, we intend the description to be a starting point for discussion with consultees and market participants, and we welcome and encourage their comments and input. For these purposes, the description in Appendix 4 has also been uploaded to GitHub at https://github.com/LawCommissionofEnglandandWales/Crypto-token-definition where consultees can comment on the description directly.

10.4 In this consultation paper, we use the term cryptoasset as a related legal concept. A cryptoasset in this sense constitutes a composite of a crypto-token and any associated or linked property or other legal rights that are recognised in law as existing as a consequence of having legal rights in relation to that crypto-token. We discuss how any property or other legal rights might be associated with or linked to crypto-tokens in more detail in Chapter 14.

10.5 In adopting these terms we acknowledge that our concepts of crypto-token and cryptoasset are not entirely aligned with how the term cryptoasset has been used in legal commentaries such as the UK Jurisdiction Taskforce, Legal Statement on

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698 For the reasons set out below, we consider that most crypto-tokens are likely to satisfy the criteria of data objects described in Chapter 5. However, it is possible that a crypto-token could be created which does not satisfy the criteria (either intentionally or unintentionally).

699 Nor is it intended to form the basis of statutory drafting, and we do not intend or suggest that this description should be used to replace or amend other proposed legislative definitions of the term cryptoasset. See (in the context of civil forfeiture): https://www.gov.uk/government/news/government-takes-landmark-steps-to-further-clamp-down-on-dirty-money, and HM Treasury, "UK regulatory approach to cryptoassets and stablecoins: Consultation and call for evidence" (January 2021), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/950206/HM_Treasury_Cryptoasset_and_Stablecoin_consultation.pdf.

cryptoassets and smart contracts ("UKJT Statement")[700] and recent UK regulatory initiatives undertaken by the Financial Conduct Authority and others.[701] Those commentaries generally use the term cryptoasset interchangeably to describe both a crypto-token and a cryptoasset (in the sense that this consultation paper uses each of those terms). Nevertheless, we consider that adopting our alternative multi-tier terminology is helpful in distinguishing between, and describing, both the general nature of data objects as things, and the range of combinations of legal rights that can be associated with such data objects. We also regard our definitional approach (and in particular our reference to tokens) as appropriate in light of more recent market developments and emerging use cases. In that sense, this use represents a continuation of the ongoing process of refining descriptive and analytical terminology in this field (similar to how the term cryptoasset itself was coined as a more suitable generic term to replace the term cryptocurrency).[702]

Technical concepts and technology-specificity

10.6 We do not attempt comprehensively to describe the technical features of crypto-tokens or cryptoassets.[703] Instead, this chapter assumes that the reader has a working knowledge of the technical features of common crypto-token implementations. However, for consistency with the UKJT Statement and existing case law which relied on the UKJT Statement, at Appendix 6 this consultation paper reproduces (with permission) the high-level descriptions of cryptoassets (as defined therein) and distributed ledger technology that were annexed to the UKJT public consultation on cryptoassets and smart contracts ("UKJT consultation").[704] Readers may wish to read those appendices before reading this chapter.[705]

10.7 While our work seeks to support and facilitate the use and development of crypto-tokens, it remains neutral as to the advantages and disadvantages of any single crypto-token, protocol, system, network or technological feature. However, our work is not strictly "technology-neutral", because it necessarily discusses existing technology used in relation to crypto-tokens, most specifically cryptography.[706]

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700 UK Jurisdiction Taskforce, *Legal Statement on cryptoassets and smart contracts* (November 2019): https://technation.io/lawtechukpanel/ ("UKJT Statement").

701 Financial Conduct Authority, *Guidance on Cryptoassets*, PS19/22, July 2019: https://www.fca.org.uk/publication/policy/ps19-22.pdf.

702 See eg recent market commentary which refers to "tokens", such as Commissioner Hester Peirce's "Token Safe Harbour Proposal 2.0": https://www.sec.gov/news/public-statement/peirce-statement-token-safe-harbor-proposal-2.0. See also the HMRC *Cryptoassets Manual*, which repeatedly refers to "tokens": https://www.gov.uk/hmrc-internal-manuals/cryptoassets-manual.

703 The variation and technical complexity of crypto-tokens and cryptoassets and their myriad implementations are beyond the scope of a law reform consultation paper.

704 UK Jurisdiction Taskforce, *Public consultation: The status of cryptoassets, distributed ledger technology, and smart contracts under English private law* (2019) Annexes 2 and 3. We note that these annexes contain high-level descriptions only and that the technical implementations of different cryptoassets (as defined therein) are both varied and complex. We also note that these annexes, having been published in 2019, do not necessarily remain consistent with nor reflective of the emergence and establishment of more recent technical innovations and market standards.

705 See Appendix 6. See also Appendices 3 to 5 for more detail on crypto-token implementations.

706 Including public-private key cryptography and public key infrastructure.

10.8 Where possible, our proposals for law reform in this consultation paper focus on changes to underlying legal principles of private law. In that way, we aim to avoid endorsement (or censure) of any one crypto-token, protocol, system, network, or technological feature and to prevent our proposed reforms from becoming quickly outdated. In so doing, we aim to "future-proof" our law reform proposals as far as is possible, while preserving the market's flexibility to innovate.[707]

LEGAL THINGS

10.9 As we explain in Chapter 2, the term property refers not to a thing at all but a socially approved power-relationship in respect of (or between a person and) a socially valued asset, thing or resource.[708]

10.10 So, an important starting point is to identify a thing, before asking whether that thing can be the object of property rights.

10.11 We suggest in Chapter 2 that identifying a thing for the purposes of property law involves "separating out and depersonali[sing] a chunk of the world", by treating that chunk of the world as a thing that can be the object of property rights.[709]

Crypto-tokens as things

10.12 Separating-out and depersonalising chunks of the world into things is sometimes an easy task — a tennis ball is a thing.[710] But, in the case of crypto-tokens, that task can be much more difficult.[711] Yet only when the thing that is a crypto-token is properly identified, can one consider whether property rights can (and if so, whether they should) relate to that thing.

10.13 It is worth nothing that some commentators and market participants suggest that crypto-tokens constitute "a form of property that can exist without relying on the state, centralised authority, or traditional legal structures."[712] The suggestion is that, because

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707 We recognise, however, that it might be the case that technology advances in ways that are not compatible with our proposals. In that case, further law reform might be required in light of the products of any such advances.

708 See paras 2.10 to 2.11 above. As we discuss in those paragraphs, the power in relation to the thing can be described as "the control over access of the thing and the ability to exclude others from it", see Edelman J in *Hocking v Director-General of the National Archives of Australia* [2020] HCA 19 at 205.

709 H E Smith, "The thing about exclusion" (2014) 3 *Property Rights Conference Journal* 95, 119. Or, in other words, explaining the "legal mode of existence" of that thing: J G Allen, "Property in Digital Coins" (2019) 8(1) *European Property Law Journal* 64, 65.

710 Most would agree that a tennis ball, as a physical object, is a thing, even though in a modular sense it consists of two glued together rubber half shells covered in felt.

711 In 2010, when discussing a description of bitcoin for a submission to the social news website Slashdot, Satoshi Nakamoto said "writing a description for this thing for general audiences is ... hard. There's nothing to relate it to." Although Satoshi Nakamoto did use the term thing in that post, it is perhaps unlikely that they had in mind the specific question as to whether a bitcoin is a thing for the purposes of property law: https://satoshi.nakamotoinstitute.org/posts/bitcointalk/threads/79/.

712 E Chason, "How Bitcoin Functions as Property Law," (2018) 49 *Seton Hall Law Review* 129, 171. Note that in this article Chason refers only to bitcoin. Other commentators take this argument one step further to suggest that "the key innovation of Bitcoin [is that] it detaches property rights from the legal system and the monopoly on violence." See S Zhu and Hasu, *Bitcoin and the Promise of Independent Property Rights* (2018): https://medium.com/@hasufly/bitcoin-and-the-promise-of-independent-property-rights-8f10e5c7efa8.

the technical implementations of crypto-tokens replicate or mimic some of the *functions* of legal property rights,[713] the need to rely on legal mechanisms to protect those functions is either reduced or removed.

10.14 This idea remains consistent with our definition of property as "not a thing at all but a socially approved power-relationship in respect of (or between a person and) a socially valued asset, thing or resource".[714] The principal difference is that these commentators suggest that the "social approval" element required for a crypto-token to constitute an object of property rights can be drawn from sources outside the state, a centralised authority or traditional legal structures. We suggest that while this might be true to a certain extent, the law and legal systems in fact form an important part of this "social approval" layer. Therefore, if framed in the right way, the law and legal systems might facilitate, protect and enhance the emergent properties of crypto-tokens that are achieved through social-layer level network effects.[715] We explore this concept in greater detail at paragraph 10.44 below. Regardless of the merits of either side of this argument, the thing that is a crypto-token is an important concept both from a legal standpoint, and to help understand alternative extra-legal perspectives.

Just data?

10.15 In this chapter, we argue that crypto-tokens constitute more than mere data or pure information, such that they can be an appropriate object of property rights. However, a good starting point is to acknowledge that at their most basic technical level, viewed in isolation, crypto-tokens do consist partly of data recorded by some form of distributed ledger or structured record. The software that facilitates the creation of such data is also data-based and the system or network in which the recorded data exists relies on a number of participants running software, and, in general, a combination of

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713 The technical implementations of crypto-tokens create "rivalrousness by design" — the use or the consumption of the crypto-token necessarily prejudices the use or consumption by others of the crypto-token. In addition, the technical features of crypto-tokens allow for the regulation of control over access to the crypto-token and the ability to exclude others from the use of the crypto-token. In this way, the technical features of crypto-tokens allow a crypto-token system to recognise that a particular crypto-token belongs to a particular person, thereby conferring on that individual a technical ability to exclude everyone else from the crypto-token. For other objects of property rights, this role is undertaken by the legal system, as opposed to socio-technical crypto-token systems: the legal system recognises a person's right to exclude others from their object of property rights, and imposes a duty owed by everyone else in the world, towards the right-holder, not to interfere with the object. For more detail on the concept of property rights, see Chapter 2.

714 See para 10.9 above.

715 A primary example of the importance of non-legal social-layer level network effects for crypto-tokens is the practical security and settlement assurances arising out of the costliness of reorganisational changes to the state of the distributed ledger or structured record in decentralised and/or open, permissionless systems. From a technical and economic standpoint, the settlement of transactions in such networks typically is regarded as probabilistic. Many industry participants (though not all) recognise that transactions that are widely accepted as having been confirmed at one point in time subsequently might be rearranged or reversed. There are various potential drivers of such an eventuality including a reorganisation of the transactional history occurring in the ordinary running of a network's consensus protocol, or from an attack by network participants. For more detail and references, see N Carter, "It's the settlement assurances, stupid" (2019): https://medium.com/@nic__carter/its-the-settlement-assurances-stupid-5dcd1c3f4e41. Moreover, non-legal social-layer level network effects are not limited to issues of security. They also play a fundamental role in the longevity and continued functioning of a product. See Cobie, "Tokens in the attention economy" (2021), in which the author argues that attention is a scarce resource in the modern online economy and that capturing the attention of market participants can lead to network effects that might drive certain valuations or economic models required for a particular token's ongoing existence and longevity: https://cobie.substack.com/p/tokens-in-the-attention-economy.

mathematics-based rules.[716] As we discuss in Chapter 3, neither pure data nor pure mathematics are appropriate objects of property rights.

10.16 Bitcoin, as the archetypal example of a crypto-token system, is a "communications channel" which creates a "system for electronic transactions".[717] Bitcoin — the technical system — is based on a standard system of rules, referred to as a protocol, like email[718] or the internet.[719] The Bitcoin system allows individuals from all around the world to communicate with one another without the need for a centralised intermediary to authenticate the integrity of any communication or message.[720] The native notional quantity unit[721] — bitcoin — exists within, and as a result of the Bitcoin system.

10.17 Importantly, each element of the technical layer of the Bitcoin system, and, by extension, its notional quantity unit, bitcoin, when considered in isolation, consists of data: [722]

> Every aspect of Bitcoin is text. The whitepaper is text. The software which is run by its nodes is text. The ledger is text. Transactions are text. Public and private keys are text.

10.18 It is uncontroversial that the underlying technical building blocks of a crypto-token consist of data. For example, Professor Fox describes the manifested form of a crypto-token in a crypto-token system as follows: [723]

> A [crypto-token] takes its form from the recording of transactions on a [crypto-token] system. Stripped to its elements, the [token] consists of a string of data, manifested as a readable sequence of characters, which has been generated by a transaction on the system.

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716 See eg Gigi, "Implications of Outlawing Bitcoin": "the basic building blocks of Bitcoin are: numbers, math, and the exchange of messages": https://dergigi.com/2021/08/02/implications-of-outlawing-bitcoin/.

717 Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008) at [1] and [8]: https://nakamotoinstitute.org/bitcoin/.

718 See D Sen, "What Is Email Protocol?": https://www.techwalla.com/articles/what-is-email-protocol. For more detail, see Chapter 7.

719 As the authors of *The Law of Personal Property* (3rd ed 2021) note at para 8-033, quoting R Radu, *Negotiating Internet Governance* (2019) p 52: "the modern internet rests upon the Transmission Control Protocol ("TCP"), which is a set of rules that participants in the system follow which allows 'encapsulated and decapsulated messages [to be] sent over the network, with gateways able to read the capsules, but not the content, decrypted only on end-computers'. TCP was soon supplemented by the Internet Protocol ("IP") to facilitate the routing of messages by designating a unique 32-bit number represented in dotted decimal form (e.g. 144.214.16.80) for each connected device so that it was concomitantly both host and receiver."

720 J Wales and R Ovelmen, "Bitcoin is Speech: Notes Toward Developing the Conceptual Contours of Its Protection Under the First Amendment" (2019) 74 *University of Miami Law Review* 204, 206: https://repository.law.miami.edu/umlr/vol74/iss1/6.

721 Sometimes referred to as a "cryptocurrency".

722 Gigi, "21 Lessons, Lesson 6, The power of free speech": https://21lessons.com/6/.

723 D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.13. Professor Fox refers to "crypto-coins", not crypto-tokens.

10.19 To take an example, in an unspent transaction output ("UTXO")–based system, the data string which records transactional output is referred to as UTXO.[724] UTXO is manifested as a readable sequence of characters. UTXO is viewable as a data entry, along with several other related data entries, within the record which makes-up a "transaction" appearing on the relevant distributed ledger or structured record. UTXO is usually identified in the "output" field within a transaction record.[725]

10.20 It is therefore possible to copy the unique string of data which makes up the UTXO.[726] However, if a person does so, that does not mean that person "owns", is associated with, gains access to, or controls the notional quantity of bitcoin identified by that UTXO. The unique string of data which makes up the UTXO takes on *functional* qualities only when recognised by the protocol and when it exists as part of and within the overall system or network.

10.21 As we discuss in Chapter 3, the law of England and Wales is generally reluctant to treat pure information (including data) as capable of being the object of property rights. This is for good reason.[727] Therefore, if crypto-tokens are to be capable of being the object of legal property rights at all, then there must be good reason to distinguish a crypto-token from information (including data).

10.22 We suggest that, by virtue of the active operation of a crypto-token system or network by users of that system or network, the unique data strings that exist as a result of and within that system take on certain functionality. The functionality of the unique data strings which arises as a result of the operation of a crypto-token system is one way in which the law can distinguish those unique data strings from pure information.

10.23 In this respect, Professor Fox convincingly argues that:[728]

> The digital information recording the unspent transaction output[729] is understood as something more than the information itself. The whole, seen in terms of its functions, is perhaps greater than the sum of its parts. The real objection to treating information as property should depend on the functions it is used for rather than on the plain fact that it is information.

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724 UTXO and UTXO-based systems are described in more detail in Appendix 3 and Appendix 6. As we discuss from para 12.4 and as described at para 3.24 of Appendix 3, that transactional output can be locked to the public key of a person giving them the power to "transact" with that output by authenticating a transaction operation or communication using his or her private key.

725 For further detail on the sub-fields of output fields and a more detailed explanation of transactions, see the UKJT Consultation Annex 3 para 4.1, which is reproduced with permission in Appendix 6 of this consultation paper.

726 At least for those who are comfortable enough to interact with the Bitcoin system at the code-level, as opposed to via human-facing abstractions, such as block-explorers, wallets or apps.

727 In particular, treating pure data as the object of property rights could lead to negative consequences, such as fettering the use and development of code and code-based systems, including crypto-token systems.

728 D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.43.

729 In this case, meaning the specific notional quantity of a crypto-token. Professor Fox does not refer to a "specific notional quantity of a crypto-token" but instead to "unspent transaction output", as he is referring to protocols which use a transaction-based ledger or UTXO-based systems.

10.24 In other words, as the UKJT Statement put it, "it is not what the data tells you but what it allows you to do".[730]

Crypto-tokens as data objects

10.25 So crypto-tokens are constituted of data strings, or more accurately, data structures — sets of linked or associated data. However, that data structure achieves functionality only as a result of, and within, a particular actively operating crypto-token system. On its own, neither the data structure that constitutes the crypto-token nor the crypto-token system as an inert abstract entity is capable of achieving this functionality.[731] In other words, a data structure becomes a functional data structure by its "instantiation" within a particular active crypto-token system maintained and operated by a network of users.[732]

10.26 "Instantiation" of a data structure within a particular crypto-token system means that the data structure takes on a particular, individual and distinct identity by the active operation of the rules of the crypto-token system.[733] The functional data structure then exists as a separate instance or object within the crypto-token system. The functional properties of the data structure arise only because of the way in which that unique instance or object functions in practice within the crypto-token system. It is impossible for those functions to exist if that unique instance or object does not exist. It is a particular instantiation of a data structure within an operating crypto-token system that we refer to as a crypto-token.

10.27 So a crypto-token has a form and a function.[734] A crypto-token's *form* is as a data structure — simply a set of linked or associated data. The data structure takes on functionality because some allowable operations can be effected in respect of it (in accordance with the rules of the protocol system). In the case of a crypto-token the

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730 UKJT Statement para 60.

731 In this respect, see nothingmuch: "A bitcoin is not a UTXO and it is not secret knowledge of a private key, but the combination or confluence of these two things, coincident in time. It is the owner's private capability to extend the transaction graph with a formally valid spending transaction, enforced by secrecy that defines ownership, and it is the ability to agree on a shared state which defines scarcity, since valid transactions must also be valid also (sic) with respect to the order of transactions as selected by the miners, not just covered by a valid signature,": https://twitter.com/HillebrandMax/status/1469966266802843651?s=20) and "Self-Issued Credit, Bitcoin & Ideal Money": https://gist.github.com/nothingmuch/861bb2071ba301471d4aa5cd47c6c7ef#self-issued-credit-bitcoin--ideal-money.

732 We are grateful to Peter Hunn for the conception and lengthy discussions in relation to the core principle of data instantiation within a crypto-token system, and related discussions on concepts including how crypto-tokens achieve rivalrousness by design within crypto-token systems. We understand these and other related issues and concepts will be described in more detail in a forthcoming paper: P Hunn, "Only Binary? Atoms and Bits as Objects of Property" (forthcoming).

733 The term instantiate has a philosophical meaning – "*To represent (something) by a concrete instance*" — so the functional property of a crypto-token could be seen as exemplified by the concrete instance of the actual manifestation of data within the crypto-token system (see, eg, "Properties" in *The Stanford Encyclopaedia of Philosophy* (2020): https://plato.stanford.edu/entries/properties/). Instantiate also has a technical meaning when used in computer science — "*To create an object (an instance) of a specific class*", see M Stefik and D Bobrow, "Object-oriented programming: themes and variations" (1985) 6(4) *AI Magazine* 40, 42.

734 We think that, in general, the form and function of a crypto-token must be coincident in time — they must exist at once. However, we prefer to phrase this as they "must have the capacity to be coincident in time", given our consideration of Layer 2 implementations of crypto-tokens systems in Appendices 4 and 5.

relevant data structure is, in general, the public/private key pair plus the state of the distributed ledger or structured record. In the case of bitcoin, an example would be the UTXO locked to a given address.[735]

10.28 A crypto-token's *function* arises only when the data structure is instantiated as a separate instance or object within a particular crypto-token system. A crypto-token system is manifested or realised by the active operation of a particular set of protocol rules. The protocol rules of a crypto-token system govern, among other things, the generation, authentication, sending and validation of data within the particular crypto-token system. The protocol rules also govern how changes to the distributed ledger or the structured record of the particular crypto-token system can be made and verified.[736] In the case of the Bitcoin system, the protocol rules are specified by the Bitcoin client software called "Bitcoin Core".[737]

10.29 Therefore, as a consequence of having both form and function, a crypto-token does not exist solely as a technical construct or as pure data. While its form relies on its technical instantiation as a data structure, its function is derived not merely from the abstract existence of the technical system in which it persists, but fundamentally by the active operation of that system by a network of users. A crypto-token is consequently an object that has both, and is a composite of, technical and social dimensions — crypto-tokens exist as instantiations in socio-technical systems. In that sense, they can be regarded ultimately as "human" or "social" constructs. Put another way, Professor Fox suggests that a crypto-token is:[738]

> An ideational thing containing different components. It is more complex than the £1 coin since it lacks any tangible basis and its most significant properties are matters of digital functionality rather than legal attribution. Like the coin, however, it comprises more than one component. *It is grounded in, but not confined to, the technical features of its own digital design.* Its outward manifestation is a string of data generated by transactions between participants on a distributed ledger system. But to see the asset as mere data would ignore its larger functionality, just as we would fail to appreciate the full economic or legal significance of a coin by treating it as a mere metal disc. (emphasis added)

10.30 It is crypto-tokens in this sense that we consider as having similar characteristics to other things that are capable of attracting property rights. And it is crypto-tokens in this sense that we suggest exhibit the criteria described in Chapter 5, such that they are

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735 For more detail, see C Warmke, "What is Bitcoin?" (2021) *Inquiry* 24: https://doi.org/10.1080/0020174X.2020.1860123.

736 The UKJT Statement refers, at para 65, to a "cryptoasset" as a "conglomeration of public data, private key and system rules."

737 For more detail, see the Bitcoin Core open-source project which maintains and releases Bitcoin client software, at: https://bitcoincore.org/.

738 D Fox, "Digital Assets as Transactional Power" (2022) 1 *Journal of International Banking and Financial Law* 3. Professor Fox uses the term "digital asset", whereas we chose to use the term crypto-token, given the importance of cryptography in achieving the functional qualities referred to in this chapter. See also *The Law of Personal Property* (3rd ed 2021) para 8-050: "The owner of a [crypto-token] is not so much given exclusive control over the information per se as the value of the ideational asset that the information records."

capable of being data objects within our suggested third category of personal property.

Copying a crypto-token

10.31 The concept of a crypto-token described above distinguishes a particular crypto-token — which could otherwise be referred to as a functional data object — from copyable information. The crypto-token takes on functional properties only when it exists within an active crypto-token system at a particular time.[739] If the information that constitutes the data structure is taken out of or ceases to be part of an active crypto-token system, then that information will have no functionality — it is simply a string of data. In this respect, as Gigi argues in the context of Bitcoin:[740]

> It is worth pointing out that Satoshi didn't manage to make information non-copyable. Every part of bitcoin - its source code, the ledger, your private key - can be copied. All of it can be duplicated and tampered with. However, Satoshi managed to build a system that makes rule-breaking copies completely and utterly useless.

10.32 The point being made is that knowledge of pure information is all that is needed to access, use or exploit its value. That is not true of crypto-tokens. Even if a person were to memorise the string of characters that might, on a particular protocol, represent a particular crypto-token, this is no good as naked knowledge. That string of characters is pure information, but it does not amount to the crypto-token — it is merely one element of that crypto-token and, while it is a necessary element, it is most definitely not a sufficient one. That information has little or no value outside its unique instantiation within the particular crypto-token protocol. To suggest that copying the constituent information of a crypto-token amounts to copying the crypto-token itself is like suggesting that knowing the serial number of a ten-pound note gives a person the power to spend that particular note, without having possession of the note itself. The serial number identifies a unique instantiation of discrete value, but is not valuable in its own right. The same is true of the data that make up a crypto-token. The crypto-token itself (which is made up of a data structure — plus its unique instantiation within the crypto-token system) is discrete, unique and has an independent existence in its own right, outside human minds, in a way that pure information does not.

10.33 So copying a crypto-token is, in practice, not possible. The data which constitutes the crypto-token is copyable, the software which enables the crypto-token network is copyable and the rules that network participants have to follow are copyable. It can all be replicated exactly. But the *instantiation* of a data structure within a given network cannot be copied. That is because it is not possible to replicate the network (exactly). The physical infrastructure running the software required for the network cannot be copied (exactly), the network of participants cannot be copied (exactly), and therefore the social dimension of the crypto-token cannot be copied.[741] As a discrete instance in a particular socio-technical system, each crypto-token therefore exists as an individuated and uncopyable data object.

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739 Or has the capacity to exist at a particular time, see n 734 above.

740 Gigi, "Bitcoin is Time" (2021): https://www.swanbitcoin.com/bitcoin-is-time/.

741 See J Lopp (2022): https://twitter.com/lopp/status/1488885312105365512.

10.34 This has important legal consequences because it helps to maintain the distinction between non-rivalrous information and rivalrous data objects, such that information remains as incapable of attracting property rights. For example, a private key, which is not an instantiated data structure in itself, should simply be conceptualised as information that is not capable of attracting property rights. The UKJT Statement made this point forcefully:[742]

> [A private key] is no more than an item of pure information and, like a password or a telephone number, it cannot itself be treated as property.

10.35 The same logic can be applied to the software that specifies the protocol rules of a particular system, and the distributed ledger or structured record within any particular crypto-token system. The law might protect those things *as information* by one of the means discussed in more detail in Chapter 3. But it will not treat any of those things as an appropriate object of property rights.[743]

DIFFERENT IMPLEMENTATIONS OF CRYPTO-TOKENS

10.36 In general, a crypto-token will have a set of operations or functions that the data — as a data object — can perform. We consider some of the core, indicative functions of crypto-tokens in more detail in Appendix 3.

10.37 The functions described in Appendix 3 are not exhaustive and are described with property law in mind, as opposed to from a technical perspective. Nor will every crypto-token have the same functionality. Even if it does have one of the functions described in Appendix 3, the technical implementation and practical realisation of that function are likely to vary significantly across distinct crypto-tokens. Nevertheless, the descriptions in Appendix 3 reflect the functions of some existing crypto-tokens and are merely intended to be useful demonstrative examples. Together with Appendices 4, 5 and 6, Appendix 3 provides some further detail on how we think that our concept of a crypto-token can be applied across various token implementations.

10.38 Regardless of their technical implementation, we suggest that the law can separate out and depersonalise a chunk of the world into a thing based on the *functional* properties of the specific crypto-token in question. The law can undertake this exercise regardless of how those implementations create and manifest the *form* of the crypto-token.[744] Our proposed criteria can then be applied to those things — those crypto-tokens. If the crypto-token in question exhibits those criteria, it will fall within our new, suggested category of personal property.

10.39 It is important to note, however, that the existence of property rights in relation to a thing does not affect the existence of the thing itself. Nor does the fact that property rights can relate to a crypto-token tell us anything about the "quality", "strength", "soundness" or "underlying value" of that particular crypto-token. That is likely to depend much more heavily on the crypto-token's technical implementation and its

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742 UKJT Statement para 65.

743 See also the UKJT Statement para 61.

744 For the reasons we discuss in Appendix 3, we think that the law should be capable of characterising crypto-tokens as things whether they are created through UTXO-based implementations, Account-based implementations or token-based implementations.

wider social acceptance and use. This is the same for all things that can attract property rights — some things will have more value or be more useful for certain purposes than others. For example, the many items in a car boot sale might all be capable of attracting personal property rights, but not all of them will be useful, achieve their purpose, work properly or be valuable.

SUPPORT FOR TREATING CRYPTO-TOKENS AS OBJECTS/THINGS

10.40 Treating functional data objects as objects/things is not a new idea; it was fundamental to the work of early cryptographers. For example, in 1992 Professor Dwork and Professor Naor suggested the idea that "solutions to computational puzzles could be digital objects that have some value" in their paper on the prevention of email spam.[745] In 1997, Dr Back made a similar suggestion in his Hashcash proposal.[746]

10.41 In 1998, Robert Hettinga (referencing Dr Chaum's blind digital signatures) suggested that:[747]

> You can actually create unique digital objects which can't be forged if you handle them right…
>
> [You can create] actual digital financial objects, objects which make electrons behave in certain ways online.

10.42 Similarly, Nick Szabo referred to the ability to create "unforgeably costly bits" in his writing on bit gold.[748] In his RPOW paper Hal Finney chose to describe Nick Szabo's bit gold in a different way — as "information objects which are probably costly to create".[749]

10.43 The idea that a crypto-token is capable of being an object/thing is also long-established and widespread in legal and academic commentary. Commentators describe crypto-tokens in different ways, but the following descriptions all recognise

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745 See A Narayanan, *Cryptocurrency Technologies: A Comprehensive Introduction* (2016) at XVIII, referencing C Dwork and M Naor, "Pricing via Processing or Combatting Junk Mail" (1993), *Lecture Notes in Computer Science* 740: https://doi.org/10.1007/3-540-48071-4_10. We note that more recent crypto-token protocols do not use solutions to cryptographic puzzles themselves as a "notional unit of account" — instead the solutions are used to secure the state of the distributed ledger only and indirectly lead to minting of the functional data objects that we discuss in this paper.

746 See A Back, *Hashcash — A Denial of Service Counter-Measure* (2002): https://www.researchgate.net/publication/2482110_Hashcash_-_A_Denial_of_Service_Counter-Measure/link/00b7d523761e012678000000/download, in which Dr Back discusses his Hashcash proposal five years after first suggesting it, and references Professor Dwork and Professor Naor's work of which he was not aware at the time of the original Hashcash proposal.

747 R Hettinga, "Digital Bearer Settlement" (1998): https://nakamotoinstitute.org/the-geodesic-market/.

748 Nick Szabo wrote: "Thus, it would be very nice if there were a protocol whereby unforgeably costly bits could be created online with minimal dependence on trusted third parties, and then securely stored, transferred, and assayed with similar minimal trust. Bit gold." N Szabo, "Bit Gold" (2005): https://nakamotoinstitute.org/bit-gold/.

749 See H Finney, "RPOW – Reusable Proofs of Work": https://nakamotoinstitute.org/finney/rpow/index.html.

the fundamental concept that a crypto-token is more than mere data — it is an object/thing that is a composite instance of manifested *form* and *function*:[750]

(1) a "digital token";[751]

(2) a "new legal object for representing rights of all kinds";[752]

(3) a "specific unit of transactional information that, properly understood, would make a suitable object of property";[753]

(4) an "incorporeal object", a "digital data structure";[754]

(5) a "rivalrous digital asset";[755]

(6) a "digital instrument created and transacted by software";[756]

(7) an "abstract object generated by system participants' common investiture of value upon encrypted but partially publicly accessible information, which is itself stored (as bits) across many different physical locations";[757]

(8) a thing that is "implied in transactions that transfer value from sender to recipient."[758]

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750 Many of these descriptions refer only to bitcoin, or UTXO-based systems. However, as we discuss in more detail in Appendix 3, we consider that certain other crypto-tokens, UTXO-based implementations, Account-based implementations and token implementations can be conceptualised in the same way.

751 J Allen, "Cryptoassets in private law" in I Chiu and G Deipenbrock, *Routledge Handbook of Financial Technology and Law* (1st ed 2021) n 14. See the UNIDROIT Digital Assets and Private Law Working Group, *Digital Assets and Private Law Issues Paper* (October 2021) para 32, which refers to "digital tokens which are linked to an external non-digital asset": https://www.unidroit.org/wp-content/uploads/2021/11/Study-82-WG4-Doc.-2-Revised-Issues-Paper-1.pdf.

752 "Unofficial Translation of the 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 (Tokens and TT Service Provider Act; TVTG) (Blockchain Act)" p 55: https://impuls-liechtenstein.li/wp-content/uploads/2021/02/Report-and-Application-TVTG-extract.pdf.

753 D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.05.

754 J G Allen, "Property in Digital Coins" (2019) 8(1) *Environmental and Planning Law Journal* 76, 95.

755 T Cutts, "Crypto-Property: Response to Public Consultation by the UK Jurisdiction Taskforce of the LawTech Delivery Panel" (2019). *LSE Law — Policy Briefing Paper No. 36*: https://ssrn.com/abstract=3406736.

756 A Hinkes, "Throw away the key, or the key holder? Coercive contempt for lost or forgotten cryptocurrency private keys, or obstinate holders" (2019) 16(4) *Northwestern Journal of Technology and Intellectual Property* 225: https://scholarlycommons.law.northwestern.edu/njtip/vol16/iss4/1.

757 D Carr, "Cryptocurrencies as property in civilian and mixed systems" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 7.06.

758 A Antonopoulos, *Mastering Bitcoin* (2nd ed 2018) p 1.

The symbiotic technical and social dimensions of crypto-tokens

10.44 Crypto-token systems create objects/things which replicate the characteristics of other things that can be the object of property rights, such as physical items.[759] As we suggest above,[760] a crypto-token is consequently an object that has both, and is a composite of, technical and social dimensions — crypto-tokens exist as instantiations within socio-technical systems.

10.45 The protocol rules and the crypto-token system work together to provide factual (as opposed to legal) recognition and protection for those objects/things. This is not a coincidence but an intentional feature of crypto-token systems. Vitalik Buterin suggests that protection of private property has always been an important goal of the cypherpunk movement:[761]

> Cypherpunk values are all about using cryptography to minimize coercion, and maximize the efficiency and reach of the main non-coercive coordination mechanism available at the time: private property and markets.

10.46 This is one of the reasons that some commentators suggest that:[762]

> The key innovation of [fully decentralised crypto-token systems]: [is that they] detach property rights from the legal system and the monopoly on violence. For the first time, we can have property that does not rely on a local authority to enforce and protect. It is easy to conceal, defend, divide, move, and verify — all by yourself, granting you the highest level of personal sovereignty.

10.47 Property rights are themselves a social (and legal) construct. It is an interesting question whether property rights (as opposed to certain functions of instantiated data within social-technical systems that mimic the *effects* of a property right) are capable of being detached from the legal system.[763] However, this is a separate question to the question as to whether crypto-tokens (as objects/things in themselves) exist independently of the legal system for the purposes of our criterion.[764]

10.48 At paragraph 10.83 below, we provisionally conclude that crypto-tokens (as objects/things in themselves) do exist independently of the legal system. We agree

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759 See D Fox, "Digital Assets as Transactional Power" (2022) 1 *Journal of International Banking and Financial Law* 3.

760 At para 10.29.

761 V Buterin, "Moving beyond coin voting governance" (2021): https://vitalik.ca/general/2021/08/16/voting3.html. Very broadly, the "cypherpunk movement" describes a group of individuals (who originally communicated through a group mailing list called "cypherpunks") who advocated for the widespread use of strong cryptography and privacy-enhancing technologies. For more detail, see A Narayanan, *Cryptocurrency Technologies: A Comprehensive Introduction* (2016) p 175.

762 S Zhu and Hasu, "Bitcoin and the Promise of Independent Property Rights" (2018): https://medium.com/@hasufly/bitcoin-and-the-promise-of-independent-property-rights-8f10e5c7efa8. The authors refer only to Bitcoin in this article. However, the argument is also likely to apply to other fully decentralised crypto-token systems.

763 And even if they are, they cannot realistically be detached from the wider social system, of which the legal system is a part. We think this would be particularly difficult in this context, given the importance of the social dimension to all crypto-token systems.

764 See Chapter 5 for more detail on our proposed criteria.

that crypto-tokens mimic or replicate the effect of a proprietary relationship with an object. The functionality of crypto-tokens allows a person to control access to the crypto-token and gives that person the ability to exclude others from it.[765] Our view is that the law can recognise this factual state of affairs and strengthen this technical functionality by aligning it with the social (and legal) construct of property rights. In this way, a crypto-token recognised by the law as being capable of attracting property rights would have the functional qualities of an object of property by technical design, underpinned by a social layer of legal recognition.

10.49 The concept of symbiotic technical and social dimensions of crypto-tokens was articulated in more detail by Hasu, who conceptualises Bitcoin as "a social contract, enabled and automated by a technical layer". He suggests that:[766]

> The bitcoin protocol automates the contract agreed upon on the social layer, while the social layer determines the rules of bitcoin, based on the consensus of its users. They are symbiotic: Neither of them would be sufficient without the other.

10.50 As a social institution, the law therefore has an important role to play in the formation, validity and acceptance of the social layer that is fundamental to the success of any crypto-token system. This is likely to be important for a number of different reasons which we discuss in this consultation paper. In particular, it will be important for the application of existing legal principles to crypto-tokens. Those include:

(1) the derivative transfer of title in respect of crypto-tokens;[767]

(2) custody arrangements in respect of crypto-tokens;[768]

(3) collateral arrangements in respect of crypto-tokens;[769] and

(4) how different causes of action and associated remedies might apply to crypto-tokens.[770]

10.51 The purpose of this consultation paper is to suggest that the law should be compatible with how real people arrange their lives. The more in-sync the law can be with the expectations of parties that interact with crypto-tokens, the more robust the social layer can become, to the benefit of all who interact with crypto-tokens and crypto-token systems.

Legal boundaries

10.52 On that basis, we suggest that the law should take a flexible approach to determining the thingness of a crypto-token. We suggest that the law should not solely analyse the

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765 This reflects Edelman J's concept of property rights as articulated in *Hocking v Director-General of the National Archives of Australia* [2020] HCA 19 at 205.

766 Hasu, "Unpacking Bitcoin's Social Contract" (2018): https://medium.com/s/story/bitcoins-social-contract-1f8b05ee24a9.

767 Which we discuss in Chapter 13.

768 Which we discuss in Chapter 16.

769 Which we discuss in Chapter 18.

770 Which we discuss in Chapter 19.

constituent parts of the technical implementation of a crypto-token, because those parts, taken individually, amount to data. Instead, the law should recognise a crypto-token as a particular unique, composite data structure that is instantiated in a crypto-token system and recognised by the crypto-token system's protocol rules — which manifests that instance with *form* and *function*. In this way, the law can recognise and protect a crypto-token as a thing, while appreciating the idiosyncratic technical features of that thing.

10.53 Once the thing that constitutes a crypto-token has been determined, the law can then apply existing concepts to determine whether property rights can relate to that thing. It can consider whether the characteristics of those crypto-tokens are sufficiently similar to other things that attract property rights. If property rights can relate to crypto-tokens, the law can then recognise that "through its own specialist categories of analysis, such as ownership, title and transfer".[771]

10.54 From this foundation, the law can respond by tailoring its legal interpretation to:

(1) reflect accurately the functional reality of crypto-tokens;

(2) seek to identify and provide a principled foundation for how market participants use, hold, transfer and otherwise interact with those crypto-tokens; and

(3) accept that property rights can relate to the things that are crypto-tokens, as it already has done in existing case law,[772] without the risk of treating pure information as an appropriate object of property rights.

APPLICATION OF OUR CRITERIA TO CRYPTO-TOKENS

10.55 Below we apply our proposed criteria to crypto-tokens and provisionally conclude that, in general, crypto-tokens fall within our suggested third category of personal property. At the end of this chapter, we ask whether consultees agree with our assessment.

Data represented in an electronic medium

10.56 Our first criterion is that the thing in question must be composed of data represented in an electronic medium, including in the form of computer code, electronic, digital or analogue signals.

10.57 We think that this criterion should be simple to satisfy for crypto-tokens. As we suggest above, a crypto-token is, in general, composed of a particular, individuated data structure which is instantiated within a crypto-token system (normally through the use of one or more distributed ledgers or structured records). Although the distributed

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771 See D Fox, "Digital Assets as Transactional Power" (2022) *1 Journal of International Banking and Financial Law* 3.

772 As it has done in recent cases, see: *AA v Persons Unknown* [2019] EWHC 3556 (Comm), [2020] 4 WLR 35 (High Court of England and Wales); *Quoine Pty Ltd v B2C2 Ltd* [2019] SGHC(I) 3, [2019] 4 SLR 17, upheld in part by the Singapore Court of Appeal [2020] SGCA(I) 2 (Singapore International Commercial Court and Court of Appeal); *Ruscoe v Cryptopia Ltd* [2020] NZHC 728, [2020] 22 ITELR 925 (New Zealand High Court); *Robertson v Persons Unknown* (15 July 2019, unreported) (High Court of England and Wales); *Ion Science Ltd and Duncan Johns v Persons Unknown* (21 December 2020, unreported) (High Court of England and Wales); and *Fetch.ai Ltd v Persons Unknown* [2021] EWHC 2254 (Comm), [2021] 7 WLUK 601 (High Court of England and Wales).

ledgers or structured records might be distributed across different nodes (participants) within the crypto-token system, we do not think that this prevents the data that constitutes a crypto-token from being definable or identifiable.[773]

10.58 In addition, the UKJT Statement said that:[774]

> We see no difficulty with definability or certainty. The public parameter of a [crypto-token] … interpreted in accordance with the rules of the relevant system, is sufficient in principle both to define the asset and to identify it to any person with access to the system network.

10.59 This approach has also been adopted by the courts, most notably in the UK in Mr Justice Bryan's judgment in *AA v Persons Unknown.*[775]

10.60 Our first criterion is intended to function as a broad gateway and we consider that crypto-tokens satisfy this criterion.

Independent existence

10.61 Our proposed third category of personal property admits only those things that can be properly identified as distinct objects. Those objects must exist independently from any particular person and exist independently from the legal system.

10.62 Our view is that a crypto-token has an independent existence in the form of a discrete data structure which is instantiated in a crypto-token system. Both the data structure and the crypto-token system exist as a matter of fact, albeit they are manifested or realised by the operation of software code and not physical particles — they are not tangible in the normal sense of the term.[776] A crypto-token has functionality within a crypto-token system.[777] We consider that the law is capable of treating a crypto-token, being a composite of a specific data structure and commonly-understood process or functionality, as a thing. We know that the law is capable of treating functional objects as things, at least when they are grounded in a physical item — the quintessential example being a banknote.[778] We think that the law should also be capable of treating functional objects as things when that functionality is grounded in an object manifested through a socio-technical system, such as a crypto-token. In this way, we

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[773] However, as we mention in Chapters 5 and 11, we note that certain Layer 2 crypto-token systems use advanced cryptographic technology such as ZK-SNARKs. We are interested in whether market participants consider that the concept of "data represented in an electronic medium" is broad enough to apply to such technology. For example, could some unknown data be said to be definable or identifiable even if it not capable of being retrieved?

[774] UKJT Statement para 49.

[775] [2019] EWHC 3556 (Comm), [2020] 4 WLR 35 at [59].

[776] As we suggest at para 3.8, crypto-token systems do have a tangible, albeit highly distributed, existence in that they rely on real physical infrastructure, the work of humans and/or machines, energy expenditure, network effects, liquidity, and integration in existing social, economic or financial infrastructure for their continued existence.

[777] We discuss more detailed examples of this functionality in Appendix 3.

[778] For a detailed examination of how society conceptualises functional objects, see J Searle, *The Construction of Social Reality* (1996). Searle considers that "social objects" are "constituted by social facts; and, in a sense, the object is just the continuous possibility of the activity" p 36. Searle gives a dollar bill as an example of a social object.

consider that it is accurate to describe a crypto-token as having an independent existence — at least from persons and from the legal system, each of which we discuss below.

Existence independent of persons

10.63 As we discuss at paragraph 10.15 above, crypto-tokens are distinct from information. It is often difficult to separate information either from persons, or from the medium in which it is embedded. But crypto-tokens are separable in this way — the data structure which is instantiated in a crypto-token system exists independently from any one person or any single physical medium.

Existence independent of the legal system

10.64 A fundamental feature of crypto-tokens is that they do not consist of rights (legal positions between persons vis-à-vis each other and things).[779] Instead, they are: [780]

> Created and transacted by software operated on a decentralised network of computers that are designed to remove legally accountable intermediaries from transactions between system participants.

10.65 Crypto-tokens are structured in this way intentionally. One of the primary goals of the Bitcoin whitepaper was to describe an electronic payment system that minimises reliance on trust in the enforceability of relationships between known counterparties:[781]

> What is needed is an electronic payment system based on cryptographic proof instead of trust, allowing any two willing parties to transact directly with each other without the need for a trusted third party.

10.66 In general, the term a thing in action is used to mean a right that can be enforced by court litigation, or action, such as a debt or contractual right.[782] Crypto-tokens cannot be enforced in this way, because there is no obvious obligor against whom a right in a crypto-token can be enforced. Instead, the functionality of a crypto-token vis-à-vis the crypto-token system and other participants in the crypto-token system is inherent to the instantiated crypto-token itself. So crypto-tokens are not things in action.[783]

10.67 In this way, crypto-tokens operate differently to, for example, money in a bank account.[784] If a person has £100 in a bank account, that person has a contractual right

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779 J G Allen, "Property in Digital Coins" (2019) 8(1) *European Property Law Journal* 64, 79.

780 A Hinkes, "Throw away the key, or the key holder? Coercive contempt for lost or forgotten cryptocurrency private keys, or obstinate holders" (2019) 16(4) *Northwestern Journal of Technology and Intellectual Property* 225: https://scholarlycommons.law.northwestern.edu/njtip/vol16/iss4/1.

781 Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008) at [1]: https://nakamotoinstitute.org/bitcoin/.

782 UKJT Statement para 68. In *Torkington v Magee* (1902) 2 KB 427, Channel J described things in action as "all personal rights of property which can only be claimed or enforced by action and not by taking physical possession".

783 At least in the "narrow" sense. We discuss the category of things in action in more detail in Chapter 4.

784 This point assumes that a crypto-token is held directly by a controller and not via an intermediary such as an exchange or custodian. We consider custodial relationships in more detail in Chapter 16.

against the bank to compel the bank to pay legal tender in discharge of the debt owed to him and to authorise the bank to make payments from the account as agent on his behalf.[785]

10.68 It is important to note that this concept of a crypto-token assumes that a crypto-token is held directly (in self-custody) by a user and is not held via a service provider such as an exchange or custodian. In the latter type of arrangement, the service provider will hold the crypto-tokens as things in themselves. A depositor's relationship with the service provider will therefore be more akin to a conventional banker and customer relationship and a depositor's rights are more likely to be to direct payments with the crypto-tokens or to realise their value by selling them.[786] Those type of rights would properly be characterised as a thing in action and therefore would fall outside of our third category of personal property. However, custody relationships can be complex. We consider custody relationships and the legal consequences of how those relationships can be structured in more detail in Chapter 16.

The interaction between the legal system and crypto-tokens

10.69 In Chapter 2 we suggested that whether the law will treat a thing as capable of being the object of property rights is, in part, a policy decision. The law can apply notional legal concepts (such as thingness) to specific chunks of the world, without affecting the existence of that chunk of the world.[787]

10.70 So, the law can treat crypto-tokens as objects/things that are capable of attracting property rights. But that legal approach cannot and does not alter or affect the existence of that crypto-token, or the socio-technical system that enables the creation and continuing existence of that crypto-token. Nor does the legal approach affect any of the functional properties of a crypto-token.

10.71 Crypto-tokens exist as a matter of fact. Their functionality depends on the rules of the relevant crypto-token system and the continued active operation of that system by a network of users, and not on the operation of law. In other words, no legal rule can on its own create or destroy a crypto-token — no court decision can say that a crypto-token has ceased to exist.

10.72 This can be contrasted with two examples: intellectual property rights created by statute and debt claims.

10.73 In the context of statutory intellectual property, statute creates a property right — a right that is good against the world. This property right is a legal creation separate from the underlying copyrighted "work", or the patented "invention", or the signifying

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785 D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.30. Professor Fox suggests that: "The characterisation of [a person's] entitlement as the right to enforce a debt is the flipside of the economist's observation that fiat money and bank money consist in circulating credit. Money consists in a notional loan enforceable by a creditor against a debtor (although in practice the creditor never calls in the loan for payment in legal tender)." See also *Foley v Hill* (1848) 2 HLC 28, *Lipkin Gorman v Karpnale (a firm)* (1991) 2 AC 548, 573-4.

786 See D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.31.

787 As is the case in relation to recognising body parts as objects of property rights, this may involve the exercise of legal and social judgement. See Chapter 2 n 140 of this paper.

"mark" of a trade mark.[788] The authors of *The Law of Personal Property* treat this property right as a standalone thing in itself:[789]

> In the context of intellectual property, this means that the rights conferred by the law, typically statutory, are themselves the thing.

10.74 Absent statutory intervention to create this standalone property right, the underlying work, invention or mark would not be capable of attracting property rights. This is because, as information, it is not naturally excludable and is economically "non-rivalrous".[790] The law attempts to protect these works, inventions or marks by imposing a statutorily created and artificial ability to exclude others from using those works, inventions or marks in certain ways.[791] This is intended to protect the creators or the registered owners of the works, with a view to encouraging investment in, and, significantly, distribution of the works.[792] In this way a statutory intellectual property right, conceptualised as a thing in itself, is not independent of the legal system. It is the opposite: the property right (the thing) depends wholly on the legal system.

10.75 Similarly, a debt claim depends on the legal system for its continued existence. As we discuss above, a debt claim is a thing in action. Dr Sanitt suggests that:[793]

> Things in action can be created or destroyed in only one way — through the application of a legal rule. The relevant legal rules may be set out in legislation or case law and will be applied by the courts to determine in what circumstances a thing in action has been created or destroyed.

10.76 A recent example of the exercise of the court's discretion affecting the existence of a debt claim is *Re Lehman Brothers International (Europe) (in administration) and others*.[794] The main Lehman Brothers trading company in the UK and Europe was Lehman Brothers International (Europe) ("LBIE"). LBIE entered administration in

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788 M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 9-004. For more detail, see Chapter 3 at para 3.52.

789 M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 9-003.

790 For more detail on these concepts, see Chapter 3 and J E Stiglitz, "Economic Foundations of Intellectual Property Rights" (2008) *57 Duke Law Journal* 1693, 1699–1700. Also see J Cahir, "The Withering Away of Property: The Rise of the Internet Information Commons" (2004) 24 *Oxford Journal of Legal Studies* 619, 634–635; H E Smith, "Intellectual Property as Property: Delineating Entitlements in Information" (2007) 116 *Yale Law Journal* 1742, 1822.

791 M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 9-004.

792 Whether intellectual property rights achieve this aim is contentious. For example, Boyle equates the evolution of intellectual property rights with a second enclosure movement of ""the intangible commons of the mind" which, he argues, restricts the creative potential of future generations rather than contributing to innovation. He suggests that the duration of copyright, eg, keeps important cultural artefacts locked away, see J Boyle, *The Public Domain* (2008) p 45.

793 See A Sanitt "What sort of property is a cryptoasset?" (2021) *Journal of International Banking & Financial Law* 83 (reproduced at https://www.nortonrosefulbright.com/en/knowledge/publications/26ade77a/what-sort-of-property-is-a-cryptoasset), in which the authors analyse in detail the independent existence of crypto-tokens.

794 [2017] UKSC 38, [2018] AC 465.

September 2008. Under Rule 2.86 of the Insolvency Rules 1986,[795] foreign debts of a company in administration were to be converted into sterling at the official rate on the date of the administration. The issue in the case was whether creditors who had suffered a "loss" because of the depreciation of sterling between the administration date and the payment date were entitled to claim that "loss" as a non-provable debt. The amount at stake for the foreign currency creditors of LBIE was over £1.6 billion.

10.77 The Supreme Court overturned the decision of both lower courts.[796] The Supreme Court ruled that the foreign currency creditors of LBIE did not have non-provable claims to recover "losses" arising from currency fluctuations following the start of LBIE's administration. Part of the court's reasoning was based on avoiding an interpretation of Rule 2.86 which would: "in effect operate as a one-way option on the currency markets in a foreign currency creditor's favour: a classic case of 'heads I win, tails I don't lose.'"[797] Regardless of the reasoning in each case, the exercise of discretion of the various courts was integral to the existence (or otherwise) of the foreign currency creditor's non-provable debt claim. In this sense, the debt claim could not be said to be truly independent of the legal system. As we discuss below, this is not the case for crypto-tokens.

10.78 Crypto-tokens are distinct from both statutory intellectual property and debt claims. They do not rely on a statute for their continued existence and would continue to exist even in the face of a statute prohibiting them (although it is reasonable to expect that such a statute might affect their market value).[798] Nor do they rely on the legal system for their existence and enforceability against a particular obligor. In other words, crypto-tokens exist independently from the legal system.

10.79 Nevertheless, as we discuss at paragraph 10.50 above, we consider that the legal system does have an important role to play as part of the social layer that is symbiotic with the technical layer of a crypto-token system.

10.80 In this sense, Hasu suggests that:[799]

> All institutions exist in stack. When one fails, you appeal to the next. When a market fails (e.g. because you got scammed), you appeal to a court. If the court fails (e.g. delivers bad judgment), you appeal to a higher court. This layered approach is a strength, not a weakness.

10.81 In this way, the legal system, as part of the social system, or social layer, has the potential to reinforce the overall strength of a crypto-token system, provided that the

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795 As they then were. Rule 2.86 of the Insolvency Rules 1986 has now been replaced by Rule 14.21 of the Insolvency Rules 2016.

796 For a more detailed outline of the case, see Weil LLP's summary: https://eurorestructuring.weil.com/administration/lehman-waterfall-i-uk-supreme-court-judgment/.

797 *Re Lehman Brothers International (Europe) (in administration) and others* [2017] UKSC 38, [2018] AC 465, Lord Neuberger at [91].

798 And they already exist, even in the absence of a statute *recognising* their existence.

799 See Hasu, (2020): https://twitter.com/hasufl/status/1444309259236352000.

legal system works in-sync with the technical elements of crypto-token systems.[800] There is therefore an important distinction between a crypto-token existing "independently of the legal system" and the importance that the legal system (as part of the wider social system) has in maintaining the strength and resilience of any crypto-token or crypto-token system.

10.82 Equally, although a crypto-token exists independently of the legal system, that does not mean that the legal system cannot affect a crypto-token indirectly. For example, in 2020 the US Securities and Exchange Commission filed an action against Ripple Labs Inc. alleging that the sale of a crypto-token called "XRP" was an unregistered securities offering to investors in the US and worldwide.[801] While this action did not affect the existence of XRP itself, it did impact XRP indirectly at the social layer.[802]

10.83 In summary, we suggest that a crypto-token exists independently of persons and independently of the legal system. Indeed, we agree with the Cloud Legal Project that:[803]

> To pretend that digital assets do not 'exist' in a relevant sense fails to acknowledge their importance to 21st century commercial practices, as well as to consumers' daily lives.

Rivalrousness

10.84 As we discuss in Chapter 5, a thing is rivalrous if use of the thing by one person[804] necessarily prejudices the ability of others to make equivalent use of it at the same time.[805] In Chapter 3, we suggest that pure information is the archetypal non-rivalrous resource.

10.85 This consultation paper has been careful to avoid the suggestion that information can be an appropriate object of property rights, by reference to the inherent characteristics

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800 A good example of the two systems working together could be where a thief was prosecuted for committing a "wrench attack" on a holder of crypto-tokens. A wrench attack is when a person physically attacks or threatens another person into either transferring crypto-tokens (or control of crypto-tokens) to them (see eg Finance Magnates, "Gang Attempted to Steal Bitcoin Fortune from US Entrepreneur in Spain" (2021): https://www.financemagnates.com/cryptocurrency/news/gang-attempted-to-steal-bitcoin-fortune-from-us-entrepreneur-in-spain/). We discuss how derivative transfer of title to crypto-tokens might operate in these scenarios in more detail in Chapter 13.

801 See "SEC Charges Ripple and Two Executives with Conducting $1.3 Billion Unregistered Securities Offering" (2020): https://www.sec.gov/news/press-release/2020-338.

802 For example, through a change in the market value of XRP and the continued use (or otherwise) of XRP by market participants.

803 J D Michels, C Millard, and C Reed, on behalf of the Cloud Legal Project, "*Response to Law Commission, 'Digital Assets – Call for Evidence'*" (2021) p 6.

804 Or a group of persons acting together.

805 See also T Cutts, "Crypto-Property? Response to Public Consultation by the UK Jurisdiction Taskforce of the LawTech Delivery Panel" (June 2019) *LSE Policy Briefing 36* p 2: a thing is rivalrous if its "use or consumption by one person, or a specific group of persons, inhibits use or consumption by one or more other persons."

of information.[806] Broadly, we think this is important to avoid the possibility that the law of personal property interferes with the freedom to disseminate and use information.

10.86 We also recognise at paragraph 10.17 above that crypto-tokens consist, at their most basic technical level viewed in isolation, of some data recorded on some form of distributed ledger or structured record. In other words, the basic building block of crypto-tokens is data. However, we think it is possible for rivalrous objects to be generated from non-rivalrous data. We test this reasoning against our concept of a crypto-token below.

10.87 We argue at Chapter 5, that the criterion of rivalrousness requires that it be possible to specify a rivalrous object that is different from mere information and different from the physical medium on which that information is recorded. Otherwise, there exists nothing that can be the suitable object of a property right.

Rivalrousness as a function of design

10.88 Within a crypto-token system, the data structures which record state changes to the distributed ledger or the structured record become more than mere information.[807] The data structure itself, when instantiated within a particular crypto-token system, takes on certain functionality.

10.89 It is the specific functionality of a crypto-token that makes a crypto-token rivalrous. We discuss some of this functionality in more detail in Appendix 3. A crypto-token can be constructed such that it can be associated with a specific "location"[808] within the relevant crypto-token system at any one time. A controller can then identify themselves as having the ability to control (and therefore to transact with, or use)[809] a particular crypto-token at a particular location (or "address").[810] This function allows other data to specify "what" and "how much" of a crypto-token is associated with that location, or address. It is also possible within crypto-token systems to impose a condition that must be satisfied to spend, transact, interact with or use a specific crypto-token.[811] A controller of a crypto-token can activate or unlock the crypto-token's

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806 For a more detailed consideration on this, see Chapter 3 and Chapter 5.

807 See paras 10.15 to 10.24 above.

808 We use the term "location" in a broad sense. An address simply specifies an abstract location in mathematical space — a number. For more detail, see C Warmke, "What is Bitcoin?" (2021) *Inquiry* 24: https://doi.org/10.1080/0020174X.2020.1860123. Professor Warmke also notes that in the case of the Bitcoin protocol, bitcoin addresses specify locations in mathematical space that themselves ultimately correspond to locations in geometric space, given the Bitcoin protocol's use of elliptic curve cryptography.

809 The term "use" in this context means the purposeful dealing with, or enjoyment of, the crypto-token, and so would include amendment, signing, validation by signature, disposition, transfer and the mere holding of the crypto-token. Another "use" is that a controller might simply sign a message to evidence its control over a particular crypto-token, without effecting a transaction. For example, a controller might sign a message allowing a verification bot to scan a specified public address to confirm whether that address was associated with a certain type of NFT. If the address is associated with that type of NFT, it might be given access to a chatroom for holders of that type of NFT.

810 See para 3.24 in Appendix 3 for a more detailed description of this point.

811 See A Antonopoulos, *Mastering Bitcoin* (2nd ed 2018) p 123. Antonopoulos describes the multitude of ways in which this can be done in the Bitcoin system: "Today, most transactions processed through the bitcoin network have the form 'Alice pays Bob' and are based on the same script called a Pay-to-Public-Key-Hash

associated spending conditions, in accordance with the rules of the crypto-token system within which they are recorded.

10.90 This functionality, in aggregate, operates to distinguish crypto-tokens from information in two important ways. First, while the data that constitutes the manifestation of a crypto-token can be replicated, its function within the relevant crypto-token system, as regulated by the inherent rules of the protocol, cannot. This means that crypto-tokens can be created such that they are mathematically scarce.[812] Second, the use or consumption of a crypto-token by a person[813] *necessarily* will inhibit the use or consumption of that crypto-token by another person by operation of the underlying protocol rules. In summary then, the rivalrousness of a crypto-token flows from the instantiation of the crypto-token within a particular system and the continued, factual, and active operation of that system by a network of users.

10.91 The rules of the system regulate the relationship between crypto-tokens and participants, including controllers of crypto-tokens. For example, a controller of a crypto-token has the ability to perform a unique operation (or an action) such as authenticating a message or transaction within the crypto-token system.[814] Importantly, a crypto-token is also structured so that the performance of any such operation (or action) can be regulated so as to exclude others from performing that same operation. In general, any such authenticated transaction will be recognised as valid by other participants in the crypto-token system and eventually recorded as a state change (or state changes) to the distributed ledger(s) or structured record(s) of the relevant crypto-token system.[815]

10.92 In this way, a controller can exercise control over a crypto-token to the exclusion of others, even if others can replicate in full the data that constitutes the crypto-token. This is because of the symbiotic relationship between the technical protocol layer and the social layer of a crypto-token — how the crypto-token operates within the crypto-token system vis-à-vis other system participants.

10.93 As long as the design of the crypto-token system facilitates this type of functionality, then, from a legal perspective, it does not matter whether the unique association is achieved through the authoritative fiat of a single, designated entity, or through a

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script. However, the use of scripts to lock outputs and unlock inputs means that through use of the programming language, transactions can contain an infinite number of conditions. Bitcoin transactions are not limited to the 'Alice pays Bob' form and pattern."

812 See also our discussion on copyability at para 10.31 above.

813 Including a group of persons, or controllers of a particular crypto-token, and non-person entities, such as smart contracts.

814 See J Allen, "Cryptoassets in private law" in I Chiu, G Deipenbrock, *Routledge Handbook of Financial Technology and Law* (1st ed 2021) n 14, discussing the use of the term "token": "[In computer science] a 'token' is a programming object that represents the ability to perform an action in a software system. To this extent, 'token' is entirely appropriate."

815 Subject to the transaction being included in a valid block within the crypto-token system and the subsequent recorded state change becoming probabilistically irreversible. See also Chapter 12 n 1062.

decentralised consensus mechanism.[816] As Professor Cutts suggests, what is important is:[817]

> Ensuring that multiple untrusting parties could arrive at a consensus as to who is properly entitled to a particular [crypto-token], and to ensure that consensus only ever generates a *single* answer. There are now very many models that exist on a graduated spectrum in between the "single registrar" model, and the "wholly decentralised" model.
>
> The particular consensus model supporting the framework for identifying and transferring [crypto-tokens] has no impact on the property enquiry; it does not matter that the source of rivalry is the authority of a single actor, or the consensus of multiple actors. Nor does it matter whether or not cryptography is involved (nor how it is involved). What matters, for the purposes of property law, is that the asset is rivalrous, and the nature of the asset remains sufficiently constant to permit identification as such.

10.94 In other words, rivalrousness can be generated in a centralised manner, or in a decentralised manner, or in manner that sits somewhere between the two. However, we consider that crypto-tokens are the principal example of things that satisfy the criteria described in Chapter 5 that exist today.

Rivalrousness as a function of technical scarcity

10.95 The rivalrous nature of crypto-tokens is a function of their technical scarcity.[818] Even though each of the individual data elements of the crypto-token can be copied — in the sense that the information can be reproduced on an equivalent medium — the copier does not get the same discrete instance of a crypto-token.

10.96 In addition to pure information and mathematics, crypto-tokens rely on their respective protocol rules, real physical infrastructure, the work of humans and/or machines, energy expenditure,[819] network effects, liquidity, and integration in existing social, economic or financial infrastructure.[820] As we discuss at paragraph 10.31 above, each

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816 So different designs of different crypto-token systems might generate crypto-tokens that have the characteristics of objects of property rights. However, as we discuss at para 10.39 above, the fact that a crypto-token can attract property rights tells us nothing about its inherent "quality", "strength", "soundness" or "underlying value".

817 T Cutts, "Crypto-Property? Response to Public Consultation by the UK Jurisdiction Taskforce of the LawTech Delivery Panel" (2019) *LSE Law Policy Briefing Paper no.36* p 3.

818 Although crypto-tokens might be technically scarce, achieving this technical scarcity is not. See Cobie, "Tokens in the attention economy" (2021), in which the author recognises that crypto-tokens as an asset-class are not scarce. The article goes on to contrast the technical scarcity of crypto-tokens with the scarcity of crypto-tokens that achieve widespread social use and recognition: https://cobie.substack.com/p/tokens-in-the-attention-economy.

819 For a thoughtful summary of the energy use of Bitcoin (as the largest proof-of-work based crypto-token system) see N Carter, "How much energy does Bitcoin actually consume?" (2021), *Harvard Business Review*: https://hbr.org/2021/05/how-much-energy-does-bitcoin-actually-consume. We note that proof-of-stake systems have different energy consumption properties. We also note that the Ethereum system is expected to transition to a proof-of-stake based system after the Ethereum Mainnet merges with the Ethereum Beacon Chain later this year (see https://ethereum.org/en/eth2/merge/).

820 Each crypto-token is likely to have a significantly different combination of those elements.

of these elements would need to be replicated in full to "copy" a data structure that constitutes a crypto-token.

10.97 But even an exact recreation of all of the elements of a particular crypto-token would result in the creation of a materially identical, yet distinct, network, populated by materially identical but distinct crypto-tokens.[821]

10.98 Historically, technically scarce resources have been difficult to create online. As Professor Fairfield wrote:[822]

> Traditional property law has struggled to find secure footing online. Traditional property, a system designed through a long tradition of common-law deliberation to govern interests in scarce and rival resources, did not seem at the time of the rise of the Internet to be immediately applicable to an environment in which many resources were neither scarce nor rival. At that time, the critical application of Internet technologies seemed to be unlimited duplication of non-scarce and non-rival resources. As a result, intellectual property, the law governing non-rival resources, became the dominant structure for online assets. Yet this structure is enormously inefficient for those who prefer to own rather than license.

10.99 We consider that the fact that people are unable to make concurrent use of scarce resources is, in part, a justification for the development of a system of property rights in respect of those resources.[823] Permitting infinitely replicable, non-scarce resources to be the proper objects of property rights would undermine the reasoning behind this justification. Crypto-tokens are not infinitely replicable and are technically scarce, so permitting them to be the proper objects of property rights ought not to undermine this justification.

Fragile rivalrousness and dynamic excludability in crypto-token systems[824]

10.100 We think it is important to make an additional observation in respect of a crypto-token that is designed such that it is rivalrous as a matter of fact. In crypto-token systems, rivalrousness is a fragile characteristic, and the factual ability of a person to exercise control over the access to a crypto-token (its excludability) might be dynamic over time.

10.101 In the material world, we tend to think of the rivalrousness of objects as both a static, and a binary quality that persists from their moment of creation to their moment of destruction. And, although the moral and legal elements of excludability of tangible

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821 As Taylor and Ó Floinn have noted in the context of crypto-tokens: "Even if a user were to modify a data entry in a copy of the ledger, this would not have the effect of increasing the quantity of [crypto-tokens] associated with it": A Taylor and M Ó Floinn, "Bitcoin burglaries and the Theft Act 1968" [2021] *Criminal Law Review* 163, 171.

822 J Fairfield, "Bitproperty" (2015) 88 *Southern California Law Review* 805, 839.

823 Hume, for example, speaks about scarcity mandating a system of property (see D Hume, *A Treatise of Human Nature* (1739)), but, more widely, property rights enable the resolution of conflicts about management of resources.

824 We are grateful to Professor Fox and Peter Hunn for their contributions to our analysis in this section.

objects might change over time,[825] their physical excludability is derived from their physical properties. In contrast, socio-technical system-based rivalrousness and excludability is contingent on the existence of robust technical authentication and validation mechanisms which ensure that the same data object cannot be consumed twice or associated with two addresses. Those qualities are also contingent on the continued active operation of the system by a network of users. Because of the nature of the operation of socio-technical systems, rivalrousness could be a quality that data objects can gain and lose over time. In addition, the factual ability to exclude others from the use of that crypto-token will, to some extent, be determined by the continued efficacy of the system rules and the active operation of the system itself. Therefore, we consider that rivalrousness within crypto-token systems is potentially fragile, and the practical ability to exclude others from a rivalrous crypto-token is likely to exist as a graduated quality that manifests on a continuum. This means that the extent to which functional data objects can be characterised as rivalrous and/or excludable may become more or less robust over time.

10.102 In the context of the rivalrousness and excludability of crypto-tokens in particular, we consider that the existence and extent of those qualities might be affected by the way in which some crypto-token systems are set up and operate in practice. To achieve data objects capable of attracting property rights, a crypto-token system needs to have robust authentication and validation mechanisms which can be used to uniquely associate a crypto-token with a particular person/address, and to prevent double-spending. A crypto-token system will also need to facilitate a practical method of excluding others from the use of a crypto-token. This can be achieved, broadly speaking, in different ways.

Fragile rivalrousness and dynamic excludability in centralised systems

10.103 At one end of the spectrum, there exist centralised crypto-token systems in which a small number of actors have control over the validation of the current state of and changes to the system. This is commonly described as a closed permissioned system. In such a situation, however, the factual operation of the system is susceptible to potential manipulation through the improper exercise of discretionary control by these actors. This also means that the factual characteristics of the data objects generated by the system (including their rivalrousness and excludability) are vulnerable to change. To guard against this[826] it seems necessary to introduce other types of constraints on these actors' behaviour, which will usually be extraneous to the system. For example, this can be achieved by overlaying the system with a multipartite contractual framework which utilises legal liability to disincentivise the types of actions that would destroy the rivalrousness of the system's data objects or undermine their excludability. This overlaying multipartite contractual framework might also help those systems to be characterised as independent or separable from the persons controlling the network. So while these types of system can create rivalrous and excludable crypto-tokens by design, whether crypto-tokens within such systems are truly independent of the legal system will be a matter of fact.

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[825] See Chapter 2 n 140 for further discussion in the context of recognition of sufficient excludability in relation to body parts.

[826] In the absence of the availability of game theoretic systems of economic incentives that can be deployed to support network integrity in permissionless protocols operating at scale.

Fragile rivalrousness and dynamic excludability in decentralised systems

10.104 At the other end of the spectrum are fully decentralised, permissionless crypto-token systems, in which validation is carried out by an indeterminate and potentially large number of nodes (system participants). At scale, decentralisation is designed to prevent the system, and the crypto-tokens created within it, being susceptible to manipulation through the use of economic incentive-based behavioural constraints. However, decentralisation is a feature that may only become more robust over time. At the initial stages, the crypto-token system will likely be operated by a small number of actors. This again results in the system being susceptible to manipulation since it lacks the quantity and the diversity of interests among participants required to make those economic incentive-based behavioural constraints reliably and consistently effective. Moreover, the underlying code infrastructure of these immature or relatively untested systems could have flaws which open them up to manipulation by hostile actors in future.

The relationship between fragile rivalrousness and dynamic excludability

10.105 In light of the above, we consider that the related concepts of rivalrousness and excludability have some idiosyncratic features in the context of data objects, by virtue of the design architecture of socio-technical systems.

10.106 The excludability of a particular crypto-token is likely to be affected by the rivalrousness that the particular crypto-token exhibits at any one time. If the rivalrousness of a crypto-token is destroyed, then it no longer makes sense to say that a crypto-token is excludable. Moreover, the technical mechanisms from which a rivalrous crypto-token obtains its excludability could be degraded to such an extent that the crypto-token is no longer practically excludable. A hypothetical example would be if the hashing mechanism used to derive public keys from private keys failed or was rendered less effective by other technological advancements. In such a scenario, while the crypto-tokens within the system might still exhibit rivalrousness, their factual excludability could be degraded to such an extent that it was no longer possible to exclude others from the use of such tokens.

10.107 So rivalrousness within crypto-token systems is a practical rather than a logical concept. A crypto-token must be to some degree rivalrous, depending on the practical features of its design and the enforceability of that rivalrousness (most likely through an ability to exclude others from the use of the crypto-token) at any particular time.

10.108 That necessarily means that a crypto-token might become more impregnably rivalrous and excludable because of the emergent properties of security that are achieved by the network effects of some crypto-token systems. It also means that a crypto-token might lose its rivalrous character owing to some change (or flaw) in the security design of the crypto-token system. In those circumstances, the crypto-token (or at least its composite data and instantiation within the crypto-token system) still exists, but it sheds its status as a data object. It drops out of property law.

10.109 Seen in this way, all crypto-tokens are likely be subject to some degree of leakiness or fragility as objects of property rights. And some crypto-tokens may not achieve a level of rivalrousness (and corresponding excludability) by design and therefore never qualify as objects of property rights at all. The courts, market participants and users of

crypto-tokens will need to develop and test the boundaries of these concepts as the use of crypto-tokens becomes more widespread.

10.110 This is not, however, a new problem for property law. Many tangible things are subject to similar inherent vulnerabilities. Alice's ice cream might melt in the heat before she gets around to eating it. Alice's melted ice cream loses its rivalrousness and excludability (as an ice cream, albeit perhaps not as a liquid mess) — it is no longer capable of exclusive possession — once it has turned into liquid and has run down the drain. But it was certainly a rivalrous thing capable of exclusive possession before it met its runny end. And any person who took the ice cream from Alice might still be a thief, even if ice creams by their very nature are vulnerable to melting.

Fragile rivalrousness and dynamic excludability as helpful, idiosyncratic concepts for data objects

10.111 We think that the concepts of fragile rivalrousness and dynamic excludability could be beneficial in a number of ways for analysis of data objects (and particularly, crypto-tokens). The concepts will be particularly useful in providing greater certainty that crypto-tokens can continue to qualify and retain their characterisation as objects of property uninterrupted for the duration of any transaction or holding period to which they are subject.

10.112 The courts, market participants, and users of crypto-tokens might need to consider what levels of rivalrousness (and excludability) would be sufficient for the purposes of maintaining an analysis of a crypto-token as an object of property rights. In contrast with tangible things, this analysis might be assessed, at least in part, by reference to the design intention of the crypto-token system's designer(s). A crypto-token system might be explicitly or implicitly designed to contain rivalrous and excludable objects (when it operates, or when it operates at a certain scale). If that is the case, then the crypto-tokens within the crypto-token system might be seen as appropriate objects of property rights even if there may be points in time when the excludability of those objects is limited, fragile or degraded. An example of where this might happen is when the crypto-token system is at an early stage of development or subject to transient periods of disruption. In such a case, from a legal perspective we would expect that a crypto-token (and its rivalrousness and excludability) could be seen as persisting through the period of downtime, as opposed to being "destroyed" at the start of the downtime and "recreated" once the system was back online.[827] We would however be interested in the views of consultees on this point.

10.113 Additionally, a broader assessment of rivalrousness and excludability that was able to encompass the nuances of crypto-token system design could be applied sensitively to the type of crypto-token system in question. The assessment might operate differently when applied to an open, permissionless system, as compared to when it is applied to a closed, permissioned system. In the former, the assessment might consider the extent to which rivalrousness (via excludability) is supposed to be secured by network effects and distributed economic incentives. In the latter, the assessment might consider the extent to which rivalrousness (via excludability) is supposed to be secured by mechanisms that fetter the discretion of the party or group which exhibits an otherwise disproportionate influence over the network. Such fetters

[827] For example, the Solana system has experienced some periods of downtime. See: https://status.solana.com/uptime?page=2.

might be achieved through technical design or through legal mechanisms (such as the imposition of contractual liability in the event of certain eventualities).

10.114 We consider that these kinds of assessment that encompass the nuances of technical systems and their design will become more commonplace over time, particularly in the separate context of assessing the level of decentralisation of a particular crypto-token system.[828] For our purposes, we think that these kinds of assessment will be necessary — and unavoidable — if property law is adequately to recognise and protect data objects.

Divestibility

10.115 In Chapter 5 we suggested that a common characteristic of data objects that are capable of falling within our new, suggested category of personal property is that they are capable of being divested on transfer.[829] In general, this means that, as a matter of fact, a transfer of the data object must entail the transferor being deprived of it. For crypto-tokens, this feature is normally a consequence of their technological design.

10.116 A particular problem posed by digital assets that are not divested on transfer is known as the double-spending problem. Simply put, this is the concern that a digital asset may be transferred from Alice to Bob, yet retained by Alice, who can then also transfer it to Caroline. It is a feature of assets that are not divested on transfer. For example, information can be double-spent. Alice can tell Bob a joke, and then subsequently tell Caroline the same joke. Similarly, as we discuss in Chapter 6, Alice can send Bob a copy of a Microsoft Word document, and subsequently send a copy of that document to Caroline, all the while retaining a copy herself. In contrast, tangible objects cannot be double-spent. If Alice gives Bob an apple, Alice cannot then subsequently give the same apple to Caroline.

10.117 The term double-spending problem derives from the idea that this general concern would be particularly problematic in a digital payment context. Consider a digital asset that is used as a means of payment. If Alice can pay a digital asset (such as a unit of a digital currency) to Bob, but then also pay the same digital asset to Caroline, her capacity to double-spend the digital asset will undermine trust in the payment system.[830] This may be because neither Bob nor Caroline knows which of them has actually been paid by Alice. Any transferee in the system simply will not know whether the asset that the transferor is purporting to send to them has already been "spent" in an earlier transaction with another transferee. Alternatively, if the correct analysis is that Bob and Caroline have *both* actually received the digital asset, then the undermining of trust will be because it looks like the digital asset has become (or been revealed as) non-rivalrous. Non-rivalrous things do not lend themselves well to functioning as payment mechanisms because they lack inbuilt scarcity and a means to prevent double-spending. For example, if Alice "pays" Bob by transferring to him a

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828 We think that "sufficient decentralisation" is likely to become an increasingly important legal concept. See G Shapiro, "Defining decentralization for law" (2020): https://lex-node.medium.com/defining-decentralization-for-law-58ca54e18b2a.

829 See from para 5.92.

830 Satoshi Nakamoto explicitly referred to the double-spending problem in the Bitcoin white paper: S Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008): https://nakamotoinstitute.org/bitcoin/. See also J Fairfield, "Bitproperty" (2015) 88 *Southern California Law Review* 805, 818.

digital asset, and gets something in return, then it looks like Alice, if she also keeps the digital asset after the transfer, has managed to get something for nothing.

10.118 Professor Fairfield contextualises and explains the double-spending problem as follows:[831]

> To create a coherent and useful online property system, one must solve the challenges of duplication and double spending. Duplication is the first and most immediate problem. If users can duplicate digital property, an MP3 for example, the marginal sale price commanded by the good goes rapidly to zero. Similarly, if a currency can be duplicated, the value of the currency evaporates under hyperinflation.
>
> Double spending is a specific version of the duplication problem that emerges in systems that enact partially effective duplication controls. Double spending occurs when the record owner of an asset conveys it forward to two (or more) different entities. It is an exploit of the conveyance mechanism in property systems. Such systems must permit conveyance, but if conveyance can be from A to B, or from A to C, then A may seek to benefit from a conveyance to B and then to C, with neither B nor C knowing about the other.

10.119 Our characteristic of divestibility is therefore aimed at helping easily to distinguish between rivalrous data objects and those things that are susceptible to duplication or double-spending, such that the latter are not capable of falling within our third category of personal property.

10.120 In the context of crypto-tokens, however, the characteristic of divestibility requires some further elaboration.

Transfers of crypto-tokens

10.121 As we discuss in Chapter 12, a transfer of a crypto-token typically involves the replacing, modifying, destroying, cancelling, or eliminating of a pre-transfer crypto-token and the resulting and corresponding causal creation of a new, modified or causally-related crypto-token. We discuss the legal consequences of this in detail in Chapter 13. Nevertheless, in a transfer of a crypto-token it is clear that the transferor divests themselves of that crypto-token.[832]

10.122 Put another way, the crypto-token, as a particular instantiation of both form and function within a crypto-token system is fully divested from the transferor. The constituent data which makes-up the pre-transfer crypto-token might remain either with the transferor or within the crypto-token system. For example, when a UTXO within a UTXO-based system is consumed, the functional attributes of that UTXO are exhausted, but the informational attribute remains within the system. That residual

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831 J Fairfield, "Bitproperty" (2015) 88 *Southern California Law Review* 805, 817.

832 At least as a proper object of property rights. As the UKJT Statement notes at para 45: "The data representing the 'old' [crypto-token] persists in the network, but it ceases to have any value or function because the [crypto-token] is treated by the consensus as spent or cancelled so that any further dealings in it would be rejected." Such data could be treated as pure information at that stage (albeit information that is, by design, necessary for the proper functioning of the network).

informational quality is nevertheless crucial for the functional quality of the new UTXOs that are generated on a transfer.

Not all crypto-tokens will be divestible on transfer

10.123 Because of the nuances in the design of some crypto-tokens, we think that the concept of divestibility is best considered as an important characteristic of objects that are capable of falling within our suggested third category of personal property.

10.124 In particular, we think that there are some potential scenarios in which a crypto-token might not be transferable, or that the transferability or divestibility of that crypto-token might be limited.

Non-transferable tokens: soulbound tokens

10.125 There might be good reasons to limit, or even prevent, the transferability of some crypto-tokens. A simple example is that, if a crypto-token is used as proof that the holder has done (or achieved) something then it ought not be possible for the crypto-token to be obtained by way of purchase. This might be of social importance — players of a game might want to know that a holder of a particular in-game item personally completed a certain quest. But it might also be of social importance in a more significant way. For example, if crypto-tokens are used for governance purposes, it might be important to prevent governance power from being (easily) transferable.[833]

10.126 One example is "soulbound" crypto-tokens.[834] Weyl, Ohlhaver and Buterin describe soulbound tokens as "publicly visible, non-transferable (but possibly revocable-by-the-issuer) tokens".[835] An important feature of soulbound tokens in the future might be that they could increase composability at a technical level to mirror the inherent composability and flexibility of personal property law. As Weyl, Ohlhaver and Buterin suggest:

> The future of property innovation is unlikely to build on wholly transferable private property so far imagined by web3. Rather innovation will hinge on the ability to decompose property rights to match features of existing property regimes, and code even richer elaborations.

10.127 For that reason, we consider that it might in future be possible to create a non-transferable (and, possibly, a non-divestible) soulbound token. We discuss the differences between non-transferability and non-divestibility below.

10.128 Soulbound tokens remain in an early stage of development and experimentation, but Vitalik Buterin suggests that "perhaps the one crypto-token that is the most robustly

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833 The arguments for using crypto-tokens as part of governance processes are complex, but have been discussed in detail by many commentators, including Vitalik Buterin. See eg V Buterin, "Moving beyond coin voting governance" (2021): https://vitalik.ca/general/2021/08/16/voting3.html.

834 See V Buterin, "Soulbound" (2022) for a detailed consideration of the topic: https://vitalik.ca/general/2022/01/26/soulbound.html.

835 See G Weyl, P Ohlhaver and V Buterin, "Decentralized Society: Finding Web3's Soul" (2022): https://dyfocus.com/news-media/5056da.html. The term soulbound is a reference to soulbound in-game items in World of Warcraft which, once picked up, cannot be transferred or sold to another player (see V Buterin, "Soulbound" (2022): https://vitalik.ca/general/2022/01/26/soulbound.html).

non-transferable today is the proof-of-humanity attestation".[836] In high-level terms, this is an Ethereum-based crypto-token which works as a social identity verification system for humans. Any human can create an identity token, but social verification (from other humans) and a video is required to obtain the identity token. The identity token has a built-in revocation feature which allows the original creator to make a video asking for the identity token profile to be removed. An online court decides whether or not the video request for removal was from the same person as the original creator. If an identity token profile is successfully removed, the original creator can re-apply to make a new identity token profile.

10.129 So, if a person steals or buys someone else's identity token profile, their control over that identity token profile can be very quickly taken away from them. This makes transfers of identity token profiles socially non-viable (albeit technically possible). There is therefore an argument that such tokens are not fully divestible on transfer[837] — in fact, they are intended to be the opposite. On balance, however, we consider that the way technology currently works still permits such tokens to be transferable and divestible on transfer in some sense. The idea is that they are subject to a social arrangement that makes them useless or valueless (for the specific purpose of identity/humanity attestation at least) in the hands of a third party. However, the focus of our analysis is on the characteristics of the token as a data object and not its extrinsic value or utility as a transferable asset within a community, and so we think they are technically divestible.

10.130 It is already technically possible to create tokens that are non-transferable to other addresses (at least as between public key addresses).[838] It is possible for the function the enables transferability between public key addresses to be disabled within different standard token implementations that are widely available and used in the market today. An example of this is debt tokens in Aave v2/v3 (which is a non-standard implementation of an ERC-20 token).[839] We acknowledge that these debt tokens are used to represent and track liabilities within the Aave protocol and so are not themselves treated as assets by market participants. However, these tokens do demonstrate that it is possible to remove the transfer function within a smart contract.

10.131 Some soulbound or non-divestible crypto-tokens might not be appropriate objects of property rights, even if they do otherwise satisfy the criteria we describe in Chapter 5.[840] This would likely be for similar policy reasons to those discussed in Chapter 2 at paragraph 2.71(3). For example, there might be policy reasons why identity tokens ought not be treated as capable of attracting property rights. Nevertheless, we expect that some soulbound or non-divestible crypto-tokens will be appropriate objects of property rights now and in the future. If this is correct, we would

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836 See V Buterin, "Soulbound" (2022): https://vitalik.ca/general/2022/01/26/soulbound.html. For more information, see https://www.proofofhumanity.id/.

837 Although they remain transferrable eg between different public key addresses.

838 See eg EIP 1238 which suggests a token standard for non-transferrable tokens: https://github.com/ethereum/EIPs/issues/1238.

839 See from line 122 of https://github.com/aave/aave-v3-core/blob/master/contracts/protocol/tokenization/VariableDebtToken.sol. See also https://docs.aave.com/developers/v/2.0/the-core-protocol/debt-tokens.

840 There might be eg a question as to whether a truly soulbound token was properly separable from persons.

not necessarily want to exclude such soulbound tokens from the property regime simply by virtue of their being non-transferable. This is one of the reasons we describe divestibility as an indicator, rather than a criteria of data objects within our suggested third category.

Non-transferable tokens: vote locking and other restrictions on transfer

10.132 There are a variety of technical encumbrances or processes which can be applied to otherwise transferable crypto-tokens which can render them non-transferrable. This is normally done for a set period of time, although it can be irreversible.

10.133 For example, Curve Finance is a large and important DeFi protocol which offers a way to trade stable-tokens through an automated market maker.[841] Curve Finance is a community owned and governed protocol, which uses the Curve DAO token ("CRV"). The high-level purposes of CRV are to incentivise liquidity providers in the Curve Finance ecosystem as well as getting as many members involved as possible in the governance of the protocol.[842] Hugo May explains how Curve Finance incentivises users to render some of their crypto-tokens non-transferrable (at least for a period of time):[843]

> Users have to time-lock CRV to access the full benefits of the token. Time-locking is the process of staking CRV tokens within the [Curve Finance ecosystem] for a set period of time, between one week and four years, in return for which one receives vote-escrowed CRV (veCRV). veCRV is non-transferrable and the time-lock cannot be reversed, meaning that once you convert CRV to veCRV you are stuck for the time being.

10.134 So veCRV is a non-transferrable crypto-token (albeit related to a transferrable crypto-token, CRV). The only way to obtain veCRV is by locking CRV. The maximum lock time is four years. One CRV locked for four years provides an initial balance of one veCRV. A user's veCRV balance decays linearly as the remaining time until the CRV unlock elapses.[844] Deposited CRV tokens can be withdrawn once a lock has expired.

10.135 In this way, it is possible to understand veCRV as a non-transferable crypto-token.[845] There are many such cases in the DeFi ecosystem. They are transferable to a third

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841 In high-level terms, an automated market maker is a smart-contract based mechanism which mathematically defines the price of certain pairs of crypto-tokens and provides liquidity for those pairs of tokens (in "pools"). If a person wants to swap one crypto-token for another, they can make a trade directly with the automated market maker smart contract, using the relevant liquidity pool.

842 For more detail see H May, "Convex(Curve) = Curve + 🚀" (2021): https://medium.com/coinmonks/convex-curve-curve-d7e28cd6c1d9.

843 Above.

844 See: https://curve.readthedocs.io/dao-vecrv.html#curve-dao-vote-escrowed-crv.

845 Note that because veCRV is non-transferable, further DeFi protocols have arisen which allow users to maintain liquidity which still accessing some of the benefits of veCRV. For example, in the Convex Finance ecosystem, it is possible for a user to deposit CRV into Convex instead of Curve directly. The Convex protocol converts those tokens to veCRV and credits cvxCRV to the depositor at a near 1:1 ratio with veCRV. Converting CRV to cvxCRV is irreversible (permanently, not time-locked). cvxCRV is transferable (unlike veCRV), meaning that liquidity for cvxCRV is available on third-party decentralised exchanges. See H May, "Convex(Curve) = Curve + 🚀" (2021): https://medium.com/coinmonks/convex-curve-curve-d7e28cd6c1d9.

party only in the off-chain sense. For example, it is possible to grant another person (or, alternatively, a malicious third party could gain unauthorised) access to such tokens — perhaps through access to your private key — and then intentionally or unintentionally lose access to that private key yourself.

New innovations

10.136 In general, we consider that crypto-tokens will be divestible on transfer — indeed ease of transferability, increased liquidity and increased efficiency in the deployment of capital is one of the principal driving features behind the success of many crypto-tokens.

10.137 Nevertheless, there already exist examples of crypto-tokens which are non-transferable by design. There also exist examples of crypto-tokens which, while technically transferable and, on balance, divestible on transfer, demonstrate how the technical features of token transferability are evolving. We expect innovation in this area to continue.

10.138 As we discuss in Chapter 5, a principal reason for us treating divestibility on transfer as an important indicative characteristic of data objects, rather than as a separate gateway criterion is to preserve flexibility within the law. We consider that this will allow the law, where appropriate, to characterise crypto-tokens as data objects, even if they have technical features which limit or remove their transferability and/or their divestibility.

Consultation Question 15.

10.139 We provisionally conclude that crypto-tokens satisfy our proposed criteria of data objects and therefore that they fall within our proposed third category of personal property. Do you agree?

Chapter 11: Control

INTRODUCTION

11.1 A foundational principle of personal property law is that the holder and the owner of an object may be two different persons. In other words, the person who happens to have or to hold an object at a particular moment in time may or may not be its legal owner. In this chapter, we identify the factual concept that best captures this notion of "holding" or "having", in the context of data objects. For tangible objects, the law employs the concept of possession. In our view, however, the most suitable concept for data objects is control.[846]

11.2 We begin the chapter by explaining why it is important for the law to be able to distinguish between a person who has or holds an object, and the owner of the object.

11.3 We then describe the concept of possession and explain why we do not think it is the best concept to be applied in relation to data objects. We note that in our call for evidence on digital assets we asked respondents to consider potential implications of law reform to expand the concept of possession to (some) digital assets. We also said that in our consultation paper we expected to make proposals for law reform to make (some) digital assets possessable.[847] As we suggested in our interim update paper and explain in more detail in this chapter, our further work and the feedback we received from respondents has caused us to develop and change our approach.[848]

11.4 Last, we present and evaluate our preferred concept of control. We describe the elements of a new factual concept of control for data objects and explain the legal significance of the concept of control over data objects.

11.5 There is scope within our proposed distinct third category of personal property for a multitude of different types of data objects. We consider that the concept of control is likely to be appropriate for the vast majority of these data objects. However, the criteria of our third category of personal property are not defined by the concept of control directly.[849] The concept of control might not always map neatly or consistently to those things that are capable of being data objects. For that reason, this chapter focuses on providing examples that relate to crypto-tokens. In the context of crypto-

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846 This requires a small but important caveat. Although we endorse control as the most suitable concept for data objects in general, we think that electronic trade documents are a sufficiently limited category for which possession is the preferable concept. Part of our reasoning for this is to allow electronic trade documents to receive the same legal treatment as paper trade documents. We describe our reasoning for this in more detail in Electronic Trade Documents (2022) Law Com No 405.

847 Digital assets: call for evidence (April 2021) para 1.10

848 Digital assets: interim update paper (November 2021) para 1.15.

849 In contrast to the work of the UNIDROIT Digital Assets and Private Law Working Group and the Uniform Law Commission's Uniform Commercial Code and Emerging Technologies Committee, which define the term digital asset as an electronic record which is capable of being subject to control. For a discussion of our reasoning for this distinction, see Chapter 5, from para 5.56.

tokens, the concept of control is important for a variety of legal principles. Those include:

(1) the derivative transfer of title in respect of crypto-tokens;[850]

(2) custody arrangements in respect of crypto-tokens;[851]

(3) collateral arrangements in respect of crypto-tokens;[852]

(4) how different causes of action and associated remedies might apply to crypto-tokens.[853]

TO HAVE AND TO HOLD

11.6 As we note above, it is a foundational principle of personal property law that the holder and the owner of a (tangible) object may be two different persons. It is necessary to be able to differentiate between the owner of an object and the person who happens to have or to hold it at a particular moment in time, because different legal consequences might flow from each state. For convenience, in this introductory section we describe the person who has or holds the object as the person with factual "possession or control" but, as we explain later in the chapter, they are not identical concepts.

11.7 There are many circumstances in which an object that belongs to one person is in the factual possession or control of someone else. This might be with the owner's consent, for example in a custody arrangement under which someone else holds the object for the benefit of its owner.[854] Or it might be without the owner's consent, such as where an object is stolen and under the factual possession or control of a thief. In that case, the law distinguishes between the possessor or controller of the object — the thief — and the legal owner — the victim.[855]

11.8 Although it is a lesser interest than ownership, the fact of holding an object — being in possession or control of it — is also a legally significant relationship. The person in factual possession or control of an object at a particular moment in time is the person who is able to exclude others from it, make use of it, and determine access to it. Whether a person has possession or control is initially a question of fact rather than of law and depends on a person's practical ability to deal with an object. While this factual possessory relationship will, to a greater or lesser extent, give rise to legal possessory rights, the two questions are distinct: the former describing a state of the world and the latter a particular legal interpretation of that state.

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850 See Chapter 13.

851 See Chapter 16.

852 See Chapter 18.

853 See Chapter 19.

854 This separation of ownership and (factual) possession or control is at the core of legal concepts usefully employed to analyse custody arrangements, which are an intrinsic feature of the crypto-token market. We discuss custody arrangements in more detail in Chapter 16.

855 We discuss how the principles of derivative transfer of title might apply to crypto-tokens in Chapter 13.

11.9 We now discuss these two different mechanisms for capturing a legally significant relationship between a person and an object, distinct from ownership: possession and control.

POSSESSION

11.10 As we demonstrate in previous chapters, the law of England and Wales currently draws a bright line distinction between things which are tangible and things which are intangible.[856] The former are capable of possession and the latter are not. This is because, as Lord Justice Moore-Bick stated in *Your Response Ltd v Datateam Business Media Ltd,* "possession is concerned with the physical control of tangible objects".[857]

11.11 Whatever the nature of the relationship that may exist between a person and a data object or other thing that is treated by the law as being intangible, the law does not currently recognise it as possession. As we describe above, possession is not necessarily synonymous with ownership; a person can be in possession of an object that is owned by someone else. For example, if A borrows a car from B, A is in possession of the car while B remains the owner.[858] While the possessor is not necessarily an owner, possession can nevertheless have significant consequences in determining the legal relationship between the possessor and the thing possessed[859] and, as such, amounts to a very valuable interest.

11.12 Under the law of England and Wales, the recognition that something can be possessed as a matter of law determines much about the legal treatment that it subsequently receives and has implications for the legal functionality and treatment of different forms of property. Things which cannot be possessed are excluded from a range of commercially useful legal arrangements.

11.13 For example, something which cannot be possessed:

(1) cannot, as a matter of property law, be delivered and a person cannot be a holder (for specific statutory purposes)[860] of it;

(2) cannot be the subject of a possessory security;[861]

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856 We note that this distinction is not so stark in other common law jurisdictions, including the United States.

857 *Your Response Ltd v Datateam Business Media Ltd* [2014] EWCA Civ 281, [2014] 3 WLR 887 at [23].

858 In the case of things in possession such as a car, this would be a bailment relationship. A bailment occurs when one person is voluntarily in possession of a tangible thing that belongs to (is owned by) another, usually for a specific purpose. See N Palmer, "Bailment" in Burrows (ed), *English Private Law* (2013) para 16.01.

859 Even where that possession has been acquired unlawfully.

860 See, for example, the Bills of Exchange Act 1882, which defines a "holder" as: "the payee or indorsee of a bill or note who is in possession of it, or the bearer thereof".

861 M Bridge, L Gullifer, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para 16-007: "possessory security interests are perfected by possession of the goods or their documents of title."

(3) cannot be bailed;[862] and

(4) cannot be protected by the property torts such as conversion[863] (nor by the special rule concerning the measure of damages for interference with a document embodying a debt or obligation).[864]

11.14 This raises the question of whether it would be useful to extend the concept of possession so that it can apply to data objects. Indeed, elsewhere we endorse a modest extension of possession so that it can apply to electronic trade documents in the same way that it applies to their paper equivalents.[865] However, although we think that possession is more applicable concept for electronic trade documents, we believe that the arguments in its favour in that context are less persuasive when applied to other types of data objects.

11.15 We think that there are circumstances in which it is appropriate to draw analogies between the legal principles that apply to things in possession and the legal principles that should apply to data objects. However, our conclusion is that such analogies are likely to be informative but not wholly applicable, given the idiosyncrasies of data objects (and in particular, crypto-tokens). The same is true of analogies between the legal principles that apply to things in action and the legal principles that should apply to data objects. This is one of our principal reasons for suggesting that the law of England and Wales should explicitly recognise a distinct third category of personal property.

11.16 Below, we provide a brief overview of the concept of possession under the law of England and Wales. We then explain the reasons why we are not proposing its extension to data objects in general. We begin, however, by introducing three complications that beset any attempt at a legal analysis of possession.

A complicated concept: "The term 'possession' is always giving rise to trouble"[866]

11.17 People acquire, retain, and lose possession of things all the time, and the concept generally causes little trouble, even for those with no legal training. Consider, for example, a commuter getting a takeaway coffee from a coffee shop. The commuter acquires possession of the cup of coffee when it is handed to them by the barista, retains possession as they sip it on the way to their office, and loses possession when they put it into the bin in the building's lobby area.

11.18 At first glance, then, the concept seems intuitive. However, the leading modern work on the law of personal property suggests that it is nevertheless "almost mandatory" for

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862 M Bridge, L Gullifer, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para 12-005.

863 See s 14(1) Torts (Interference with Goods) Act 1977; *OBG v Allan* [2007] UKHL 21, [2007] 2 WLR 920 at [224].

864 See eg M Jones, A Dugdale, *Clerk and Lindsell on Torts* (23rd ed 2020) para 16-106; J Edelman, J Varuhas, S Colton, *McGregor on Damages* (21st ed 2020) para 38-043, referring to *Morison v London County & Westminster Bank* [1914] 3 KB 356 CA.

865 This is primarily because the concept of possession is foundational to the marketplace practices of cross-border trade, and to the functionality of trade documents. See, generally, Electronic Trade Documents: Report and Bill (2022) Law Com No 405.

866 *Towers & Co Ltd v Gray* [1961] 2 QB 351, at 361 by Chief Justice Lord Parker.

any discussion about possession to begin with two judicial laments.[867] First, Earl Jowitt's observation that "in truth the English law has never worked out a completely logical and exhaustive definition of 'possession'".[868] Second, Lord Chief Justice Parker's complaint that "the term 'possession' is always giving rise to trouble".[869]

11.19 There appear to be three principal difficulties with possession, which can cause confusion even in the context of tangible objects. The first difficulty is that the concept appears in a range of different legal contexts (including in statutes),[870] and is sometimes modified by a variety of different adjectives (such as "constructive", "joint", and "vindicatory").[871] We are primarily concerned with what could be thought of as the "core case" of possession (sometimes called "actual" or "*de facto*" possession), which is a factual relationship between a person and an object, and from which certain legal consequences follow. By contrast, a person with an unconditional *right* to possession is often said to have "legal possession" or "constructive possession" of the object.[872] Joint and vindicatory possession are different again.

11.20 The second difficulty stems from possession's close connection to the concept of control. As we discuss below, possession as the factual relationship between a thing and a person is made up of two parts — an exclusive control element and an intention element.[873] The term control is, therefore, commonly found in judicial discussions of the concept of possession, including in the judgments in leading cases such as *The*

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867 M Bridge, L Gullifer, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para 11-001.

868 *United States of America v Doliful Mieg et Cie* [1952] AC 582 at 605.

869 *Towers & Co Ltd v Gray* [1961] 2 QB 351 at 361.

870 *Halsbury's Laws of England* (2020) vol 80 Personal Property para 845. We might compare, for example, the rules on acquiring possession of real property or tangible things, with the rules defining the criminal offence of being in possession of a controlled drug contrary to s 5 Misuse of Drugs Act 1971. For a detailed list of the different statutory contexts in which the term "possession" appears, see para 845 n 5. A particularly complicated instance of the concept appears in reg 3 Financial Collateral Arrangements (No 2 Regulations) 2003, as amended by the Financial Markets and Insolvency (Settlement Finality and Financial Collateral Arrangements) (Amendment) Regulations 2010.

871 Useful overviews of different "sub-categories" or types of possession can be found in M Bridge, L Gullifer, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) ch 11 ("Possessory interests"), and in L Rostill, *Possession, Relative Title, and Ownership in English Law* (2021) pp 7 – 22.

872 S Green, J Randall, *The Tort of Conversion* (2009) p 86. It has also been referred to as "proprietary possession": see *Hall v Cotton* [1987] QB 504, where it was contrasted with "custodial possession", by which the court seemed to mean the core case of factual possession.

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873 We note that Dr Crawford has recently developed a new theory of possession, which he has labelled an "expressive" theory of the concept: M Crawford, *An Expressive Theory of Possession* (2020) p 9. This theory is put forward as a "challenge to the standard 'control plus intention' explanation" of possession. Dr Crawford suggests that possession "describes those relations between people and tangible things which, as a matter of social fact, constitute accepted ways of claiming some form of entitlement to them". While we found this work interesting and helpful in addressing some difficult questions in the standard account of possession, we limit our discussion to the notion of possession as set out in case law.

Manchester Shipping Canal Co,[874] *Mainline Private Hire*,[875] *J A Pye (Oxford)*,[876] and *Parker*.[877] There is, however, a difficulty in precisely delineating a threshold type and level of control that is required for possession.

11.21 The third difficulty is that the vocabulary of possession is used by different writers to mean different things, and there is no settled agreement on which usages of which words are correct. To give an example: the word "possession" is used sometimes to refer to a factual state of affairs which generates, for the possessor, a particular type of legal interest in an object.[878] When Alice is in possession of a coffee cup, the fact of possession generates (among other things) a property right that grounds duties on others to refrain from interfering with the cup. Possession is, in this sense, the "root" of Alice's legal interest or entitlement to the cup. On the other hand, however, the term possession is sometimes used to denote a particular type of legal interest or title that a person can have in an object, short of ownership.[879] To say that Alice has possession of a cup is, in this sense, not merely a factual description (from which legal consequences may follow), but a description of the legal interest that Alice has in relation to the cup.

11.22 So, the term possession is sometimes used to refer to the (interest-generating) factual state of affairs, and sometimes to refer to the generated legal interest itself. And when it is used in the latter way, it is normally being used to indicate that the interest is something less than ownership. This divergence in usage is concisely summarised by Dr Crawford as follows:[880]

> There is no consensus … on whether possession is simply a fact which, when proven by evidence, creates a property right, or whether it also describes a species of legal right in an object of property that is different from ownership.

11.23 We seem to be a long way from our earlier example of the commuter getting a takeaway coffee. It may now be apparent why it is has been suggested that "possession means a different thing to lawyers than it does to everyone else".[881] In law, the meaning of possession might vary from one context to the next, and there may be a variety of different types of possession. And while a person in possession of

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874 *The Manchester Shipping Canal Co v Vauxhall Motors Ltd* [2019] UKSC 46. at [42] by Lord Briggs.

875 *Mainline Private Hire Ltd v Nolan* [2011] EWCA Civ 189, at [1] by Arden LJ.

876 *J A Pye (Oxford) Ltd v Graham* [2003] 1 AC 419, at [40] – [43] by Lord Browne-Wilkinson.

877 *Parker v British Airways Board* [1982] 1 QB 1004, at 1019 by Everleigh LJ.

878 See, for example, *Costello v Chief Constable of Derbyshire Constabulary* [2001] EWCA Civ 381, at [14(i)]; S Douglas, *Liability for Wrongful Interference with Chattels* (2011) p 32; and D Sheehan, *The Principles of Personal Property Law* (2nd ed 2017) p 14.

879 This is referred to as the idea of "possession as interest" in M Bridge, L Gullifer, G McMeel, and K Low, *The Law of Personal Property* (3rd ed 2021) at [11-004].

880 M Crawford, *An Expressive Theory of Possession* (2020) p 2.

881 S Green and J Randall, *The Tort of Conversion* (2009) p 86.

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an object is likely to enjoy some form of control over it, there is a lack of clarity over the type of control that qualifies as sufficient to amount to possession.

11.24 These types of difficulties have led Professor Hickey to observe that:[882]

> Generally, possession is thought to be a hopelessly vague concept, continually changing its content and import with the exigencies of legal practice. Textbook writers have considered it unsusceptible to satisfactory definition, and even the most positive statement of possession in the law retains some sense of apology for its ambiguity.

11.25 A degree of vagueness is not in itself an insurmountable barrier to an extension of the concept of possession to data objects; despite its complexities, it is used successfully in relation to tangible objects. In the next section, we describe a concept of possession that could be capable of extension into the realm of data objects.

What is possession under the current law?

11.26 As explained in Chapter 4, the current law of England and Wales suggests that there is a sharp distinction between tangible and intangible things, and only the former are capable of possession.[883] Accordingly, the first step in describing a concept of "digital possession"[884] would be to distil the concept of possession down to its essential components, and to assess whether these could apply to data objects in a coherent way.

11.27 Our starting point is that the essence of possession is a factual relationship between a person and an object, from which certain legal consequences follow.[885] Possession is made up of two parts: an exclusive control element and an intention element (assessed as a matter of fact). As Lady Justice Arden (as she then was) explained in *Mainline Private Hire*:[886]

> To have possession of land or a [thing], a person must have not only the requisite degree of actual custody and control but also an intention to exercise that custody and control on his behalf and for his own benefit.

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882 R Hickey, *Property and the Law of Finders* (2010) p 162.

883 See *OBG Ltd v Allan* [2007] UKHL 21, [2008] 1 AC 1; *Your Response Ltd v Datateam Business Media Ltd* [2014] EWCA Civ 281, [2014] 3 WLR 887; and *The Environmental Agency v Churngold Recycling Ltd* [2014] EWCA Civ 909, [2014] WLR(D) 295.

884 This phrase was used by Professors Fox and Gullifer, the Cloud Legal Project, and Professor Allen in their respective responses to our call for evidence on digital assets — as a concise shorthand for an extended concept of possession that might apply to data objects.

885 "Possession is a matter of fact rather than a matter of law": S Green, J Randall, *The Tort of Conversion* (2009) p 108. Professor Sarah Green is the Commissioner for Commercial and Common Law at the Law Commission of England and Wales, and lead Commissioner for this project.

See also Douglas's assertion that possession "simply describes a factual state of affairs": S Douglas, *Liability for Wrongful Interference with Chattels* (2011) p 32; and Penner's view that "possession refers to a situation of fact which describes the control that a person may have over an object": J Penner, *The Idea of Property in Law* (1997) p 144.

886 *Mainline Private Hire Ltd v Nolan* [2011] EWCA Civ 189, at [1].

11.28 In general, the law will deem a person to have acquired possession of an object when they have a sufficient level and type of control over it, and when this control is accompanied by the right type of intention towards the object. We consider these elements below.

The first element of possession: exclusive control

11.29 The first element of possession requires a person to exhibit a certain type of control over the relevant object of property rights. This control must be judged against "the nature of the relevant subject matter and the manner in which that subject matter is commonly enjoyed".[887] Such control must be "exclusive", although it need not be singular and can therefore be consensually shared or "joint".[888]

11.30 Broadly speaking, someone in control of an object determines, as a matter of fact, "how [an object] is kept, whether it is used and, if so, the manner in which it is used".[889] The legal rights that any person may have in relation to the object are not relevant to this assessment.

11.31 Exclusivity describes the nature of the relationship between persons and a thing; not its extent. In addition, possession does not need to be unassailable: common law title is relative and not absolute. As Sir Frederick Pollock and Sir Robert Wright observed, in their seminal work on possession in the common law:[890]

> Exclusive occupation or control, in the sense of a real unqualified power to exclude others, is nowhere to be found. All physical security is finite and qualified.

11.32 The requirement that a person's control need not be absolute or "impregnable",[891] but merely sufficient, is evident from case law. In the recent case of *The Manchester Shipping Canal Co*, for example, all members of the Supreme Court agreed that a person in possession has "a *sufficient* degree of physical custody and control" over the relevant object of property.[892]

11.33 Although the Supreme Court's formulation refers to "physical" control, the nature of the relevant control will correspond to the nature of the property in question. It must be

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887 *J A Pye (Oxford) Ltd v Graham* [2002] UKHL 30, [2003] 1 AC 419, at [41]; see also *The Tubantia (No 2)* [1924] P 78, 89.

888 *J A Pye (Oxford) Ltd v Graham* [2002] UKHL 30, [2003] 1 AC 419, at [38]; *Bannerman Town v Eleuthera Properties Ltd* [2018] UKPC 27 at [52]. Joint possessors exert control over an object to the exclusion of all others apart from each other.

889 L Rostill, *Possession, Relative Title, and Ownership in English Law* (2021) p 17.

890 F Pollock and R Wright, *An Essay on Possession in the Common Law* (1888) p 12. The phrase "real unqualified power" should be understood as referring to a factual power (or perhaps, an ability), rather than a legal power.

891 L Rostill, *Possession, Relative Title, and Ownership in English Law* (2021) p 17 n 62.

892 *The Manchester Shipping Canal Co v Vauxhall Motors Ltd* [2019] UKSC 46, [2020] AC 1161, at [42], [55], and [89] (emphasis added). This case is about possession of land, but the statement is of a more general application. See the equivalent formulations of the exclusive control limb in *Mainland Private Hire Ltd v Nolan* [2011] EWCA Civ 189 ("the requisite degree of actual custody and control"), which was a case about a Peugeot taxi.

judged against "the nature of the relevant subject matter and the manner in which that subject matter is commonly enjoyed".[893]

11.34 For land, the relevant type of control will be physical control. In *J A Pye (Oxford)*, for example, the farming land in question was enclosed by hedges and accessible only through a padlocked gate.[894] The key was held by the defendants and so the land was "within their exclusive physical control".[895] This can be contrasted with the decision in *Red House Farms (Thorndon)*, where a possessor's control of a piece of land was rooted in the fact that they had regularly shot at birds over the land for some years, and had determined when others could do the same.[896] This somewhat unusual factual basis was found to be sufficient because: [897]

> What constitutes possession of any particular piece of land must depend upon the nature of the land and what it is capable of use for … the only profitable use of this land was for shooting.

11.35 For tangible things, the relevant type of control is also likely to be physical control, and each case will similarly turn on its facts. For example, the way that control is exerted over a small tangible object will be different from how control is exerted over larger objects. In *Parker v British Airways*, Parker found a gold bracelet on the floor, picked it up, and handed it over to an official in British Airways' lost property department.[898] These acts were sufficient to constitute control.[899] In contrast, some objects fit less comfortably in the palm of one's hand than a bracelet does, and control becomes more than a matter of tactile contact. In *The Tubantia*, the relevant object was the wreck of a Dutch steamship which had sunk to the bottom of the North Sea.[900] Work on the wreck was rendered intermittent by the depth to which the vessel had sunk, as well as by adverse weather conditions and changing tidal patterns. Nevertheless, the claimant salvage company was found to have the level of control necessary for possession. This was grounded in the fact that the claimant had worked on the wreck when conditions permitted, placed buoys to mark the wreck's position, and kept

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893 *J A Pye (Oxford) Ltd v Graham* [2002] UKHL 30, [2003] 1 AC 419, at [41] by Lord Bingham; see also *The Tubantia (No 2)* [1924] P 78, at 89, by Sir Henry Duke.

894 The land also allowed some modest pedestrian access through a footpath, but this was deemed immaterial in the context of a dispute about farming land. See also *The Manchester Shipping Canal Co v Vauxhall Motors Ltd* [2019] UKSC 46, [2020] AC 1161, especially at [57] by Lord Briggs.

895 *J A Pye (Oxford) Ltd v Graham* [2002] UKHL 30, [2003] 1 AC 419, at [41].

896 *Red House Farms (Thorndon) Ltd v Catchpole* [1977] 2 EGLR 125.

897 *Red House Farms (Thorndon) Ltd v Catchpole* [1977] 2 EGLR 125, by Lord Justice Cairns. His Lordship also referred to the Privy Council decision in *Umma v Appu* [1939] AC 136, where control was located in the cutting of grass.

898 *Parker v British Airways Board* [1982] 1 QB 1004, at 1007.

899 Parker relinquished possession in the act of handing the bracelet over. But the salient point is that the fact that Parker was able to hand the bracelet over to another indicated that, prior to so doing, Parker was in exclusive control of it. Exercising a factual ability to transfer an object is an act of control.

900 *The Tubantia (No 2)* [1924] P 78.

vessels and divers at the site of the wreck both to work upon it and to prevent any opportunistic "new-comers" (competitors) from working on it.[901]

11.36 One may also have possession of a thing which is locked in a safe or a warehouse, for example, by having (control over) the key to the safe or warehouse, rather than having the thing in one's immediate physical possession.[902]

11.37 So different types of objects are amenable to different types of control.[903] Sir Frederick Pollock and Sir Robert Wright make the point that:[904]

> It is not possible, as a matter of fact, to possess a house, a wood, or a field in the same manner as we possess money in our pockets, or the owner of a cart and horse possesses them when he is driving the horse in the cart. There can only be a more or less discontinuous series of acts of dominion. What kinds of acts, and how many, can be accepted as proof of exclusive use, must depend to a great extent on the manner in which the particular kind of property is commonly used.

11.38 Similarly, Dr Rostill says:[905]

> What counts as effectively determining how a thing is dealt with depends, in part, upon the nature of the thing, for divergent things admit of different forms and degrees of control.

11.39 Importantly, however, the fact that control is object-sensitive does not mean that we cannot identify overarching themes that hold across different objects of property. Those most salient to the assessment of exclusive control are those of access and use, judged against the nature of the particular object under consideration (including the way in which that type of object is commonly dealt with). To the extent that people are able to determine the access to and use of rivalrous data objects, these considerations seem similarly applicable. It is therefore plausible that a data object could be subject to a sufficient level of exclusive control, notwithstanding that such control may operate differently from the way that control is normally exerted over tangible objects.

11.40 Exclusive control is, however, only a necessary and not a sufficient condition for the acquisition of possession. It must also be accompanied by the right type of intention.

The second element of possession: intention

11.41 The second element for the acquisition of possession is that a person exhibits an intention to exclude the rest of the world from the object of property; an intention to

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901 *The Tubantia (No 2)* [1924] P 78, at 90.

902 *Your Response Ltd v Datateam Business Media Ltd* [2014] EWCA Civ 281, [2015] QB 41, at [18] and [23] by Lord Justice Moore-Bick.

903 For an insightful discussion about the possession of shipwrecks, foxes, fish, and whales, see M Crawford, *An Expressive Theory of Possession* (2020) p 62.

904 F Pollock and R Wright, *An Essay on Possession in the Common Law* (1888) p 30. This passage was cited with approval by Lord Justice Lewison in *Chambers v Havering London Borough Council* [2011] EWCA Civ 1576.

905 L Rostill, *Possession, Relative Title, and Ownership in English Law* (2021) p 17.

exercise exclusive control for the time being.[906] This intention has been referred to as the "intention to possess"[907] or, in older authorities, as the "*animus possidendi*".[908] In *J A Pye (Oxford)*,[909] the House of Lords approved the description given by Mr Justice Slade in the earlier case of *Powell v McFarlane*:[910]

> The *animus possidendi* involves the intention, in one's own name and on one's own behalf, to exclude the world at large … so far as is reasonably practicable and so far as the processes of the law allow.

11.42 A possessor does not have to demonstrate an intention to own the relevant object; a person's intention to possess can co-exist with the knowledge that there is a person with a better title to the object. Additionally, intention is, like exclusive control, a question of fact that, in the event of dispute, generally falls to be proved by the party asserting possession. Intention is usually demonstrated by way of inference from facts about the world, including a person's actions and, in particular, those actions through which a person satisfies the exclusive control element of the formulation.[911] Intention can also be passive, in the sense that a person can be deemed to have the requisite intention, for example, to possess everything in a particular drawer, safe or warehouse.[912]

11.43 The question of intention is less dependent on the nature of the thing than the question of what amounts to control. The existence of intention is perhaps also less likely to be disputed. However, debates as to intention do arise,[913] and, if challenged, intention would have to be demonstrated to establish possession.[914]

A concept of possession for data objects?

11.44 When a person has exclusive control over an object, and the right type of intention towards it, the law will deem them to have acquired possession of it. As the law currently stands, this is, in general, correct only in relation to tangible objects.

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906 "An intent to exercise exclusive control over the thing for oneself": *J A Pye (Oxford) Ltd v Graham* [2002] UKHL 30, [2003] 1 AC 419, at [71] by Lord Hope. Like exclusive control, intention is a necessary but not sufficient condition for possession. Intention without control does not amount to possession: see *Marsden v Miller* (1992) 64 P & CR 69.

907 *J A Pye (Oxford) Ltd v Graham* [2002] UKHL 30, [2003] 1 AC 419, at [42] – [43]; L Rostill, *Possession, Relative Title, and Ownership in English Law* (2021) p 19.

908 *The Tubantia (No 2)* [1924] P 78, at 89; *Powell v McFarlane* (1979) 38 P & CR 452 (Ch), at 471; *Parker v British Airways Board* [1982] 1 QB 1004, at 1019.

909 *J A Pye (Oxford) Ltd v Graham* [2002] UKHL 30, [2003] 1 AC 419, at [43].

910 *Powell v McFarlane* (1979) 38 P & CR 452 (Ch), at 471 – 472; approved in *J A Pye (Oxford) Ltd v Graham* [2003] 1 AC 419, at [43].

911 "Intention may be, and frequently is, deduced from the physical acts themselves": *J A Pye (Oxford) Ltd v Graham* [2002] UKHL 30, [2003] 1 AC 419, at [40] by Lord Browne-Wilkinson.

912 See also below at para 5.75.

913 See eg *J A Pye (Oxford) Ltd v Graham* [2002] UKHL 30, [2003] 1 AC 419; *Parker v British Airways Board* [1982] 1 QB 1004.

914 Note that intention is also a key element of the Scots law on possession: see H MacQueen and The Rt Hon Lord Eassie, *Gloag and Henderson: The Law of Scotland* (14th ed 2017) para 30.09.

11.45 But it is interesting to note that the extension of a particular, idiosyncratic concept of possession to intangibles is a step that has already been taken under the law of England and Wales in the context of financial collateral arrangements. The Financial Collateral Arrangements (No 2) Regulations 2003[915] ("FCARs") disapply certain rules and formalities for collateral arrangements falling within its scope, in pursuit of marketplace efficiency. For an arrangement to fall within the FCARs, one requirement is that the financial collateral is "in the possession or under the control of the collateral-taker or a person acting on its behalf".[916] Despite some initial uncertainty,[917] it is now apparent that the concept of possession embodied in the FCARs can apply to intangible assets.[918] However, we consider that the concept of possession, as expressed in the FCARs, is an idiosyncratic and distinct concept to the broader, general principle of possession that we discuss in this chapter. On that basis, the fact that the FCARs uses the term "possession" does not necessarily provide a good argument that the overall concept can or should be extended to data objects.

11.46 In this section, we evaluate the arguments for and against extending the concept of possession to data objects. We ultimately (albeit provisionally) conclude that possession is not the most appropriate concept to apply to data objects.

The advantages of possession

11.47 There are three principal arguments in favour of reforming the concept of possession such that it could apply to data objects in the same way as it currently applies to tangible objects.

11.48 The first argument is that making data objects possessable would automatically imbue them with a significant level of commercially useful functionality. This is because other legal concepts that are currently engaged only by possessable objects, would then apply to data objects. For example, extending the concept of possession to data objects would make them transferable by way of delivery. It would also mean that wrongful interference with a data object could be remedied through the property torts. As Victoria Ball noted in response to our call for evidence, making data objects possessable:

> Would allow a claimant to claim in conversion for interference with data objects. Conversion is an important element of the protection of property, but conversion protects property through the protection of possession.

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915 As amended by the Financial Markets and Insolvency (Settlement Finality and Financial Collateral Arrangements) (Amendment) Regulations 2010. The FCARs are retained EU law under section 1B(2) of the European Union (Withdrawal) Act 2018, as inserted by s 2 European Union (Withdrawal Agreement) Act 2020. The FCARs implement the European Union's Financial Collateral Directive: Directive 2002/47/EC of the European Parliament and of the Council of 6 June 2002 on financial collateral arrangements.

916 FCARs, reg 3.

917 In *Gray v GTP Group Ltd* [2010] EWHC 1772 (Ch), at [53], Mr Justice Vos (as he then was) held that "possession has no meaning in English law as regards intangible property".

918 This much is clear from: (1) partial definition of "possession" that was added to the FCARs by the 2010 amendments, in the wake of Mr Justice Vos's decision in *Gray v GTP Group Ltd* [2010] EWHC 1772 (Ch); and (2) Mr Justice Briggs's (as he then was) statement that "it would be wrong to limit 'possession' in such a way as to exclude any application to intangibles": see *Re Lehman Brothers International (Europe) (In Administration)* [2012] EWHC 2997 (Ch) at [131].

11.49 Additionally, if data objects were possessable, they could be the object of possession-based arrangements such as bailment, or used as collateral in possessory security arrangements such as the pledge.[919] In short, employing the concept of possession would allow data objects to be plugged directly into an existing network of commercially useful legal devices.[920] To the extent that any of these ancillary legal concepts struggled to adapt to data objects, that could subsequently be remedied with modest and focussed legal development (whether by way of statute or through common law reform).

11.50 The second, related, argument in favour of extending the concept of possession is that it might help to avoid distinctions in the law that are difficult to justify, and that could lead to unfair results. Hin Liu gives the following example, in the context of blockchain-based tokens linked to underlying securities:[921]

> If we do not extend possession-dependent doctrines to blockchain securities *at all*, this may produce unfairness. For example, if a hacker destroys a [data object] token, or if a transferor rescinds a [data object] token transfer and the transferee refuses to return it, these acts would constitute conversion if the [data object] token were physical. There is a strong argument that the mere lack of physicality should not make a difference.

11.51 This feeds into a wider point: to the extent that tangibility is merely a proxy for more fundamental indicia of possessability, an extension of the concept of possession is justifiable as a matter of principle. In fact, such an extension might help to nuance the sharp distinction that the law currently draws between tangible and intangible objects.

11.52 The third argument for an extension of the concept of possession is that it would help to preserve the current state of the marketplace, at least for dealings in data objects that are governed by the law of England and Wales. The business community values the certainty that continuity provides. Marketplace preference should not necessarily be determinative, but if it is possible to achieve reform through several different routes, there is an obvious argument in favour of the course of action that best preserves the prevailing commercial approaches.

11.53 As noted above, we think that this latter argument has considerable force in relation to electronic trade documents. Respondents to our electronic trade documents consultation paper agreed with us. For example, Professor Fox and Professor Gullifer said:

> We acknowledge the advantage of using the concept of digital possession to explain the transfer of property in electronic trade documents. The reason is that the

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919 Hin Liu suggests that "The doctrines of bailment, conversion, trespass, reversionary injury, pledges and liens…would presumptively apply to digital assets". H Liu, Title control and possession in the digital asset world (2020) *Modern Studies in Property Law Conference 2022*: https://dx.doi.org/10.2139/ssrn.4079185 (forthcoming in Lloyd's Maritime and Commercial Law Quarterly).

920 We think it very unlikely, for example, that a court faced with the issue would conclude that a concept such as a pledge is in fact limited to objects of property that can be possessed *and that are tangible*. Instead, we think that, if rendered possessable, a court would conclude that a data object could be pledged.

921 H Liu, "The legal nature of blockchain securities" [2021] *Lloyd's Maritime and Commercial Law Quarterly* 476, p 500.

proposed electronic regime is modelled directly on existing transactions with tangible documents. The delivery of the documents is the key concept in explaining how title in them is transferred.

11.54 Similarly, the Cloud Legal Project said:

> We recognise that digital possession may bring advantages in terms of facilitating trade … if a digitised version of [a bill of lading] were also capable of possession these commercial transactions [such as a pledge for an advance of funds] could be expected to continue without any need for further legal change. It may therefore be helpful to introduce digital possession as a simple way of preventing the need to reinvent those transactions.

The disadvantages of possession

11.55 There are four principal arguments against an extension of the concept of possession to data objects, and in favour of the development of a different operative concept.

Market practice

11.56 The first argument is a direct rebuttal of the business continuity argument in favour of extending the concept of possession to data objects. Namely, that the argument for preserving the status quo has significantly less force in relation to data objects in general, for which there is less settled market practice.

11.57 This applies in at least three different but important ways for nascent data objects such as crypto-tokens. First, market practice in relation to crypto-tokens is highly iterative — mirroring the iterative and evolutionary nature of the underlying crypto-tokens, crypto-token systems and technology itself. Crypto-tokens evolved as a response to perceived failures of existing market practice — for example, as a response to some of the trade-offs required by a need to interpose a trusted intermediary within almost all electronic transactions for value.[922] An argument for development of the law based on the maintenance of the status quo might therefore seem blinkered.

11.58 Second, applying possession wholesale to data objects would not accord with market practice in any event. Given the historic legal position that possession is only applicable to tangible assets, market practice in relation to crypto-tokens does not, and never has, centred around or relied on either the factual or legal concepts of possession. Therefore, reform which applied the legal concept of possession to data objects in general would be highly likely to undermine, confuse and potentially fracture the complex, sophisticated and varied legal structures that the crypto-token markets have developed over the last 13 years.[923] This is particularly true of certain crypto-token custody markets which have developed on the basis of the intermediated securities model. We discuss this in greater detail in Chapter 16.

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922 Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008) at 1: https://nakamotoinstitute.org/bitcoin/."

923 See also H Liu, Title control and possession in the digital asset world (2020) Modern Studies in Property Law Conference 2022: https://dx.doi.org/10.2139/ssrn.4079185, at [15] (forthcoming in Lloyd's Maritime and Commercial Law Quarterly).

11.59 The City of London Law Society ("CLLS") made this argument powerfully in their response to our call for evidence. They gave the example of the digitalisation of money market instruments ("MMIs") in 2003.[924] They said that, in reforming the law to provide a basis for MMIs, care was taken not to disrupt existing market practice by applying rules developed for tangible assets to a framework designed with intangible shares and registered securities in mind. In the context of crypto-tokens they suggest that market participants are likely to have determined a highly nuanced and technology-specific framework which ensures the coherence and finality of transfers.[925] The CLLS also note that some of the solutions adopted in the context of MMIs might be helpful by way of analogy with certain Layer 2 applications or implementations.[926] They suggest that the common law concept of possession is not as flexible nor in some ways as developed[927] as other existing concepts (including those developed in equity).[928] This might mean that it is not sufficiently flexible to apply to complex financial markets that process a highly diverse, multi-faceted set of transactions and rely on a variety of interlocking legal structures.

11.60 Third, and following on from the above arguments, applying the legal concept of possession to data objects is likely to be more interventionist than applying the concept of control. The law of possession brings with it many years of conceptual development based on dealings with tangible objects. By contrast, as we discuss below, the concept of factual control is less constricted by historical associations.

11.61 Throughout this consultation paper, we argue that the law of England and Wales provides a highly flexible legal toolkit for structuring legal arrangements involving data objects. We think that the ability of the law of England and Wales to embrace data objects — in different ways and through the application of different legal principles — is particularly advantageous in a market which includes many different technical implementations, systems, networks and legal structures. In Chapter 14, we go on to consider how data objects, as discrete objects of personal property rights, can be used in multiple different ways to achieve different types of functionality. In Chapter 16, we consider a variety of different ways in which complex custody arrangements involving crypto-tokens might be structured. And, in Chapter 18, we discuss how

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924 City of London Law Society, "Digital assets: the limits of the concept of possession" (2021) p 7: https://www.citysolicitors.org.uk/storage/2021/08/Digital-Assets-The-Limits-of-the-Concept-of-Possession-13-08-21.pdf.

925 City of London Law Society, "Digital assets: the limits of the concept of possession" (2021) p 4 – 7: https://www.citysolicitors.org.uk/storage/2021/08/Digital-Assets-The-Limits-of-the-Concept-of-Possession-13-08-21.pdf. The legal analysis of transfer and settlement finality in respect of crypto-tokens is necessarily technology-specific, given the idiosyncratic way in which crypto-tokens are transferred. We discuss this in more detail in Chapter 13.

926 We briefly discuss how some of the concepts in this consultation paper might apply to different Layer 2 implementations in more detail in Appendix 5.

927 In certain contexts, for example, for the legal treatment of holding arrangements of fungible, commingled and unallocated assets.

928 City of London Law Society, "Digital assets: the limits of the concept of possession" (2021) p 8: https://www.citysolicitors.org.uk/storage/2021/08/Digital-Assets-The-Limits-of-the-Concept-of-Possession-13-08-21.pdf.

collateral arrangements in respect of data objects might operate. For these reasons, we agree with the view of the CLLS that:[929]

> It is unlikely to prove helpful, and may indeed undermine the certainty of English [and Welsh] law, to seek to make all types of digital [object] amenable to possession.

Complexity of the concept of possession

11.62 The second argument against an extension of the concept of possession to data objects is that this would further complicate an already complex legal concept. As a product of common law development, the concept of possession has been incrementally developed to achieve justice in a variety of different factual scenarios. Although the "starting point" is the "common sense 'factual' notion of possession", the concept has already been extended to the point where "many instances of possession in English law are examples of *legal fictions*".[930]

11.63 By way of illustration, the authors of *The Law of Personal Property* refer to situations where the law has recognised "constructive possession, such as the shipper of a cargo's constructive possession of the goods shipped".[931] They also refer to "many instances of what is regarded as actual or legal possession, such as over a vessel, aircraft or shipwreck".[932] To that we may add situations of "vicarious possession", where the law has recognised a person as possessing an object through another. For example, the law may recognise Bob as the possessor of an object even though Alice has control of the object, if Alice intends to exercise that control in Bob's name.[933] Similarly, the law may recognise Bob as the possessor of an object if Alice acquires control of the object (with the right type of intention) in the course of her employment by Bob.[934] As Professor Penner put it, "although possession is a matter of fact, one can count on legal systems to deem certain circumstances to constitute possession in order to reflect the interests of owners".[935]

11.64 In light of this complexity, the current concept of possession has been described as "too broad and 'lumpy' for the various practical problems which it has been deployed to deal with".[936] If that is already so in relation to tangible things, then it should give

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929 City of London Law Society, "Digital assets: the limits of the concept of possession" (2021) p 2: https://www.citysolicitors.org.uk/storage/2021/08/Digital-Assets-The-Limits-of-the-Concept-of-Possession-13-08-21.pdf.

930 M Bridge, L Gullifer, G McMeel, and K Low, *The Law of Personal Property* (3rd ed 2021) para 11-002 (original emphasis). See also the complications discussed above from para 11.17.

931 M Bridge, L Gullifer, G McMeel, and K Low, *The Law of Personal Property* (3rd ed 2021) para 11-002.

932 Above.

933 *Bannerman Town v Eleuthera Properties Ltd* [2018] UKPC 27 at [54]; *Malik v Malik* [2019] EWHC 1843 (Ch) at [38].

934 *Parker v British Airways Board* [1982] 1 QB 1004, at 1017; and see also L Rostill, *Possession, Relative Title, and Ownership in English Law* (2021) pp 21 to 22.

935 J Penner, *The Idea of Property in Law* (1997) p 144.

936 M Bridge, L Gullifer, G McMeel, K Low, *The Law of Personal Property* (3rd ed 2021) para 11-002, citing Karl Llewellyn's criticism that English law has a tendency towards "lump concept" thinking, from "Through Title to

pause for thought to anyone advocating for a further stretching of the concept into the realm of data objects. We think that this type of concern underpins three responses that we received to our call for evidence, with which we are sympathetic:

(1) Dr Crawford said that rendering data objects possessable "would further complicate the already complex concept of possession".

(2) Professor Low said that making data objects possessable:

> Would be quite undesirable … the extension of 'possession' unavoidably employs a metaphor which is likely to be difficult to apply. The result would be that the development of the law will be left to the vagaries of litigation.

(3) Professors Fox and Gullifer said:

> Our concern is that possession has a highly specialised meaning that has developed to govern its use in transactions involving natural persons and tangible assets such as land or goods. Much of the law has developed in relation to situations where tangibles are not in the actual physical control of the person who is claiming to be in possession of them or who is claiming to sue on a possession-based title (eg someone who has temporarily lost something). To accommodate these, the common law has developed subtly different grades of possession (such as actual vs constructive possession and factual vs legal possession) to explain the incidence of rights between the parties and the world at large. It may well be that such accretions are not necessary or desirable for the law relating to digital assets.

Core elements of possession

11.65 The third argument against applying possession to data objects is that there are three core aspects of the concept of possession that seem less applicable to data objects than they are to tangible assets. The first of these is that possession is a "visible, factual relationship between a person and some object that is capable of being owned".[937] Insofar as the relationship between a person and a data object will be relatively less visible,[938] possession seems to be a relatively less suitable concept.

11.66 The second core aspect that seems ill-fitted to the digital world is possession's element of intention. A relatively larger number of dealings with data objects are automated,[939] as compared to dealings with tangible assets. This means that the necessity of finding intention makes it relatively harder to apply the concept of possession. This is a point that was made forcefully by Professors Fox and Gullifer, in response to our call for evidence:

Contract and a Bit Beyond" (1938) 15 *New York University Law Quarterly Review* 159 and "Across Sales on Horseback" (1939) 52 *Harvard Law Review* 7.

937 This point was made by Dr Crawford in his response to our digital assets call for evidence.

938 Or, at least, determinable from physically observable factual circumstances alone.

939 For example, via interacts with, or as between, smart contracts (including, but not limited to smart legal contracts). For more detail, see Smart legal contracts advice to Government (2021) Law Com No 401: https://s3-eu-west-2.amazonaws.com/lawcom-prod-storage-11jsxou24uy7q/uploads/2021/11/Smart-legal-contracts-accessible.pdf.

> The determination of possession in law depends as much on the intentions of the parties to the transaction as it does on the fact of exclusive control asserted over the asset in question. Our concern is that many digital transactions are entirely automated in their operation. They execute in the way their programmers designed them to. To search for an element of human intentionality, which may be what a notion of possession would require, risks introducing an unreal human element to what is often an automatic process.

11.67 The response from the CLLS also makes this point, noting that it sometimes would be difficult, in the context of data objects, to found title on the basis of possession when intention is required. The element of intention might suggest a more onerous test than the mere entry on a distributed ledger or structured record within a socio-technical system. We discuss how the legal principles of derivative transfer of title might apply to crypto-tokens in more detail in Chapter 13.

Practical consequences

11.68 We note at paragraph 11.48 above that expanding the application of the concept of possession to data objects would allow existing and established legal principles to be directly applicable to those objects. However, the development of those principles happened in the context of tangible assets. The fourth argument against an extension of the concept of possession is that a close examination of the nature of data objects reveals idiosyncrasies that are better catered for by the development of a new, but functionally similar, concept. As Professor Allen wrote:[940]

> While it might be possible to stretch the concept of possession to embrace data objects, less is gained than is potentially lost. In my view, the major cost of 'stretching' is the lost opportunity of developing concepts tailored to the digital nature of [crypto-tokens].

11.69 In Professor Allen's view, the preferable approach is "to develop legal concepts that are tailored to the technologies used to create financial assets today".[941] We agree. The development of a new operative concept is likely to be preferable to stretching the concept of possession to the point where it snaps, or modifying it to the point of disfigurement.[942] In Professors Fox and Gullifer's evocative language, there comes a point "where the extension of existing legal concepts to new technological forms ceases to be an exercise in analogy and instead becomes an exercise in fiction".[943]

11.70 One example of where this might have practical consequences is in relation to the tort of conversion. As the Cloud Legal Project noted, there is a "general concern that the

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940 J G Allen, "Cryptoassets in private law" in I Chiu and G Deipenbrock, *Routledge Handbook of Financial Technology and Law* (2021) p 317.

941 J G Allen, "Negotiability in digital environments" (2019) *Journal of International Banking and Financial Law* 459 p 459.

942 Professor Watterson makes the same point, albeit his preferred imagery is that of "straining" the concept of possession: "Contextual and Conceptual Foundations of Private Law Claims Involving Cryptocurrencies" in C Mitchell and S Watterson, *The World of Maritime and Commercial Law: Essays in Honour of Francis Rose* (2020) p 337.

943 This point was made by Professor Fox and Professor Gullifer in their joint response to our digital assets call for evidence.

strict liability associated with the tort of conversion is not appropriate for digital assets". In their view, although exceptions could be made for "cases of accidental or good faith interference" with data objects, overall it "may be better to recognise digital assets as a third category of personal property, subject to distinct sui generis remedies".[944] We discuss how causes of action and associated remedies (including conversion) might apply to crypto-tokens in more detail in Chapter 19.

11.71 Similarly, the concept of possession has simply not developed in relation to intangible things because, as a general principle, it has never applied to them. The concept of possession is therefore less well-suited to dealing with intangible[945] objects than other concepts such as the law of trusts and multi-partite contractual frameworks which have had to develop frameworks for dealing specifically with intangibles. One particular difficulty that has not been well considered, for example, is how the concept of possession might apply to fungible intangible assets that are held on a commingled and unallocated basis.[946] Applying the law of possession to data objects therefore risks adding uncertainty to the law of England and Wales, as opposed to removing it.

11.72 We also consider that the proper legal characterisation of on-chain transfers of crypto-tokens is not entirely straightforward. If data objects were possessable, it would follow that the concepts of delivery — and perhaps of sale and transfer by deed or bill of sale — that apply to tangible objects could be mapped-onto the transfers of data objects. However, as we suggest in Chapter 13, while the concept of delivery is helpful as an analogy, it is not wholly applicable to data objects. Similarly, we do not think it is appropriate for the concepts of a transfer by sale or a transfer by deed or bill of sale to wholly apply to data objects. In Chapter 14, we discuss how crypto-tokens can be used to structure a variety of legal relationships, including where a crypto-token is simply used as a record of ownership (by analogy with other types of assets, such as shares or registered securities).[947]

11.73 In addition, the market has developed solutions (including technical solutions) to using data objects as collateral. Because the concept of possession has not traditionally applied to intangible objects, those solutions are not based on possessory security concepts such as pledges or liens. Instead, crypto-token collateral facilities will either be characterised or structured as title transfer collateral arrangements or, where a security interest analysis is intended or more appropriate, as (non-possessory)

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944 This point was made by the Cloud Legal Project in their response to our digital assets call for evidence.

945 Or, at least, objects that do not have a tangible existence in the normal meaning of the term.

946 We discuss this in more detail in Chapter 16. The CLLS argue that: "Under English law, the issue of appropriation as relating to the creation of a trust over intangible, fungible assets has now largely been resolved as a practical matter by the decision of the Court of Appeal in *Hunter -v- Moss [1994[1 WLR 452*. As under current English law an intangible asset is not considered to be possessable, the English courts have not been required to date to develop similar jurisprudential reasoning to support the transfer, possession or bailment of an intangible, fungible asset that *ex hypothesi* is incapable of identification and segregation from another interchangeable asset." City of London Law Society, "Digital assets: the limits of the concept of possession" (2021) p 6: https://www.citysolicitors.org.uk/storage/2021/08/Digital-Assets-The-Limits-of-the-Concept-of-Possession-13-08-21.pdf.

947 The importance of retaining the ability to structure a variety of legal relationships was emphasised by the City of London Law Society in its response: "Digital assets: the limits of the concept of possession" (2021) pp 3 to 6: https://www.citysolicitors.org.uk/storage/2021/08/Digital-Assets-The-Limits-of-the-Concept-of-Possession-13-08-21.pdf

charges or mortgages. We therefore consider there to be no real practical benefit to crypto-token collateral arrangement participants in extending the concept of possession to data objects. We discuss issues relating to collateral arrangements in respect of crypto-tokens in more detail in Chapter 18.

11.74 The crux of these arguments is that there are many different data objects, each with different technical implementations. Those data objects are used in a wide variety of different ways, using an equally wide variety of legal structuring tools under the law of England and Wales. They would not all benefit from a wholesale application of the law of possession. In fact, some could be negatively affected by the application of the rules of possession, which could have the effect of undermining the certainty and inherent flexibility of the law as an efficient and malleable structuring tool.

Conclusion on possession

11.75 On balance, we do not consider that it is appropriate to apply the concept of possession to data objects in general. That conclusion is bolstered by the strength of the arguments in favour of a new concept of control, to which we now turn.

CONTROL

11.76 The most viable alternative to an extension of the concept of possession is the development of a new, but functionally similar, concept that is more sensitive to the idiosyncrasies of data objects. Such a concept can capture the essence of the factual relationship that, for tangibles, constitutes possession. However, it can do so in a way that avoids importing the aspects of possession that are less suitable for the digital realm.

11.77 We think that such a concept, which we explain in detail below, might be labelled *control*. A person in control of a data object stands in the same type of factual relationship to that object as a person in possession stands to a tangible object, but possession requires the additional element of intention so the two are not identical.

Describing a concept of control for data objects

11.78 In this section, we begin by discussing situations in which the law of England and Wales already applies a notion of control to objects of personal property. We then explain how a new concept of control over data objects fits into our overarching analysis of property law, and our recommendation for the explicit recognition of a third category of data objects. We then set out our provisional description of a concept of control.

Existing notions of control in the law of England and Wales

11.79 The law of England and Wales is familiar with applying notions of control to both tangible and intangible objects of personal property rights.

11.80 In the first instance, and as discussed above, control features as a component element of the concept of possession of tangibles. More specifically, a person in possession of an object has factual control over that object — they have a practical ability to determine access to the object, and to put it to the various uses of which it is capable.

11.81 Additionally, control features as a distinct concept in the FCARs, which provide for the disapplication of certain rules when intangible financial collateral is "in the possession *or under the control*" of a collateral taker. However, similar to the way in which those regulations use possession, control is an idiosyncratic and distinct concept under the FCARs. In its current form it has been applied by the courts not (or not exclusively) as a question of fact, but fundamentally as a characterisation of a particular distribution of legal rights between the parties to a collateral arrangement. It operates as a perfection requirement that in its formulation and application is intended to strike a balance between promoting market efficiency and safeguarding parties from collateral arrangements and their third-party creditors from fraud and other risks. We consider therefore that the distinct concept of control under the FCARs is not the same as the factual concept of control we describe in this chapter.

11.82 Another important point to note is that this provision in the FCARs (as interpreted by courts in this jurisdiction and by the Court of Justice of the European Union) has proved problematic for marketplace actors. As Professors Fox and Gullifer commented in response to our call for evidence on digital assets: "The concept of control, as defined by the FCARs and the courts, has caused a great deal of difficulty". We also understand from feedback to our call for evidence that ongoing analysis is being undertaken in the market as to how to reform the FCARs, should that be considered desirable. We understand that the purpose of such analysis is to consider how to introduce nuance, certainty and clarity to the concept of control in its practical application to common collateral management practices within the confines of the statutory FCARs regime.

11.83 For those reasons, in our view, it is undesirable to try and build on, or replicate, the concept of control that appears in the FCARs which applies in the limited context of specific types of collateral arrangements. Instead, we consider that a better approach is to describe a concept of control that is more closely aligned to the factual notion of control that forms part of the common law concept of possession. A (new) factual concept of control that applies to data objects should also coherently fit into our overarching analysis of property in the law of England and Wales, and our recommendations for the explicit recognition of a distinct, third category of personal property.

Control over objects of property

11.84 In Chapter 4 we provisionally conclude that the most appropriate way for the law of England and Wales to accommodate certain types of data objects is as members of a distinct third category of personal property. We suggest that the data objects that fall into this third category will be those that meet the criteria that we set out in Chapter 5. For present purposes, the most important of these is the criterion of rivalrousness.

11.85 In many examples of data objects, the quality of rivalrousness will emerge as a consequence of the designed rules of a particular technological network or system in which that instance of a data object exists. As we explained in Chapter 5, if an object is rivalrous then it is likely to be (factually) excludable. This means, in general, that the ability factually to determine access to the data object can be sufficiently concentrated into a single person's[948] hands. In general, we think that the person who is able to

[948] Or a group of persons.

exclude others from, and make use of, a rivalrous data object should be recognised as having "control" of that object. Accordingly, the type of control that we think is most suitable for these purposes is (positive and negative) factual control. Whether a person is in control of a data object should depend on the factual ability to determine use that the person has over that data object, rather than on the legal rights that they may have in relation to it.

11.86 As noted above, this means that our preferred concept of control can be understood as an analogue to the common law concept of possession, albeit without requiring the element of intention.[949] A useful rule of thumb may therefore be that a person in control of a data object enjoys a level of control over that asset that would satisfy the control element of possession, were the object in question tangible.[950] The Uniform Law Commission's Uniform Commercial Code and Emerging Technologies Committee (the "ULC Committee") also describes the concept of control in their suggested new Article 12 of the Uniform Commercial Code in the following terms:[951]

> It may be useful to think of control as the rough functional equivalent of possession of tangible personal property such as goods.

11.87 Additionally, our preferred concept of control aligns with the UNIDROIT Digital Assets and Private Law Working Group's ("the UNIDROIT Working Group") "control principle" for digital assets.[952] According to the principle's explanatory notes, control is a "purely factual matter" or a "factual standard".[953] Furthermore, our concept of control aligns with the views expressed by several eminent consultees in response to our call for evidence. For example, Professor Goode expressed a preference for an approach that involved "treating control as doing for intangibles what possession does for tangibles". Similarly, Professor Fox and Professor Gullifer said:

> We would … suggest that serious consideration is given to using the concept of factual control as the defining concept rather than that of possession. We suggest that the concept used … needs to be a factual one.

11.88 Although the provisional view implicit in our call for evidence was to extend the concept of possession to digital assets in general, we now consider that it would be

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949 See our discussion on the difficulties with applying the intention element of possession to data objects at paras 11.65–11.67 above.

950 This is an observation that is made by Hin Liu in "The Legal Nature of Blockchain Securities" [2021] *Lloyd's Maritime and Commercial Law Quarterly* 476. He suggests that "despite the fact that possession under English law is a concept that does not apply to intangibles, one can exercise a degree of control over a blockchain security token which would amount to possession if it were a physical asset".

951 See Uniform Law Commission, *Draft - Uniform Commercial Code and Emerging Technologies - 2022 May 16-18 Meeting* p 145: https://www.uniformlaws.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=fa5c6c1b-c612-c453-b39d-8b4e3e8496f3.

952 See, generally, UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)*: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

953 UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* pp 19 to 20: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

preferable to embrace a new — albeit functionally similar — concept of control. We discuss our reasons for that conclusion in more detail below. Before that, however, we set out what we mean by control in this context, which aligns closely with the current formulation of UNIDROIT's control principle,[954] and the definition of control used by the ULC Committee in their suggested new Article 12 of the Uniform Commercial Code.[955]

11.89 At the end of this chapter we consider options for how the law of England and Wales could develop the concept of control, as applicable to data objects. We also discuss how the broad concept of control, as described below, may require significant refinement or malleability if it is properly to encompass the variety of possible relationships involving data objects. As we discuss in Chapter 5, rather than using the factual concept of control as a definitional characteristic of data objects, we instead consider how it might best be thought of as an important element of the way in which persons can interact with the object. In particular, we consider how the broad concept of control might be best thought of as an important constituent element of a higher-level organising or framing principle in the context of certain complex legal mechanisms or structures. In other words, the concept of control alone might not be nuanced, refined, or market-specific enough adequately to deal with complex legal arrangements. It could, instead, form a constituent element of how those arrangements could be thought about or structured. We discuss this in more detail in relation to transfers of crypto-tokens in Chapter 13, custody arrangements in Chapter 16 and in relation to collateral arrangements in Chapter 18.

Control in this context

11.90 We suggested that having control of a data object is functionally similar to having possession of a tangible object.[956] A person in control of a data object stands in the same type of factual relationship to that object as does a person in possession of a tangible object. As we explain in later chapters, we think that the concept of control in relation to data objects is necessary to help the law develop consistent principles in relation to data objects. In some ways, we expect those principles to function in a similar way to principles that rely on the legal concept of possession.

11.91 Broadly speaking, we think that the person in control of a data object at a particular moment in time[957] is the person who is able sufficiently:

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954 See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 19: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

955 See Uniform Law Commission, *Amendments to the Uniform Commercial Code* (2022) pp 106 to 107: https://www.uniformlaws.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=67fe571b-e8ad-caf8-4530-d8b59bdca805.

956 The UNIDROIT Working Group takes the same approach. In describing its principle of "control" is says that "'control' assumes a role that is a functional equivalent to that of 'possession' of movables". See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 19: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

957 We discuss the concept of "time" in Appendix 3 and 5 in the context of Layer 2 implementations of crypto-tokens, and Appendix 4 in the context of our short-form, tentative description of a crypto-token. As we

(1) to exclude others from the data object;

(2) to put the data object to the uses of which it is capable;[958] and

(3) to identify themselves as the person with the abilities specified in (1) to (2) above.

11.92 These elements require further explanation. The first element of this description captures the notion of excludability, which is at the core of the concept of property rights.[959] As the UNIDROIT Working Group notes, for example, "the ability to exclude is an inherent aspect of proprietary rights".[960] A person in control of a data object will be able to prevent others from putting the data object to the uses of which it is capable. This is the idea of negative control. It may also be expressed as an ability to prevent others from accessing the functionality of the data object.[961] The formulation of this ability currently favoured by UNIDROIT is to require of a person in control that they have "the exclusive ability to prevent others from obtaining substantially all of the benefit from the digital asset".[962] However, we prefer to describe it in more neutral terms to avoid any implication of any "value" judgement in respect of the terms "substantially" and "benefit" when applied to any particular data object.

11.93 The second element reflects the positive dimension of control — the ability to use the asset. The notion of "use" should be understood as referring broadly to any deliberate actions that can be taken in relation to the data object, and will include effecting a change of control, if that is something of which the data object is capable. When taken together with the first element of control, we think that these two elements capture the exclusivity dimension inherent in personal property rights in relation to an object. And, by analogy, we think they reflect how the exclusivity element of possession works: a person in possession of a tangible object determines access to it, and the uses to which it is put. The same is true of a person in control of a data object. The difference, however, is that for certain types of data objects these abilities will manifest not through tactile contact (or the use of more general physical mechanisms), but in the ability to use or employ the relevant control mechanism. For example, in systems that generate and maintain rivalrous data objects through public-private key cryptography, the person in control will be able to exclude others from the data object as a practical matter by controlling access to their private key.

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suggest, the concept of time might have to take on a level of nuance if it is accurately to apply to, for example, crypto-token systems which may use different methods of establishing a canonical and chronological order of transactional events or state-changes.

958 Including, if applicable, to effect a passing of, or transfer of, that control to another person, or a divestiture of control.

959 See from para 2.70.

960 UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 19: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

961 For example, the ability to authenticate an operation in respect of the particular data object (including an operation to effect a change of state of the distributed ledger or structured record).

962 UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* Principle 6 s (1)(a)(ii): https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

11.94 Additionally, this second element aligns with the similar formulation in UNIDROIT's control principle. Specifically, UNIDROIT's principle requires that a person in control has "the exclusive ability to change the control of the digital asset to another person"[963] as well as "the ability to obtain substantially all the benefit from the digital asset".[964] According to UNIDROIT, "these requirements contemplate that 'control' assumes a role that is a functional equivalent to that of 'possession' of movables".[965] For the reasons above, we chose not to describe control using the reference to "obtain[ing] substantially all the benefit from the digital asset". However, we consider that the ability to put the data object to the uses of which it is capable is, nonetheless, an important element of control.

11.95 The third element requires a person in control to be able to identify themselves as being able to exclude others from the data object and being able to put the data object to the uses of which it is capable. In the majority of cases, this element will be trivial. However, for certain types of data objects — such as those existing within pseudonymous crypto-token systems — it is important for there to be a mechanism by which a person may identify themselves as being in control of a particular data object. This is captured in the UNIDROIT Working Group's control principle as the requirement that "the digital asset or its associated records allows the person to identify itself as having the abilities [to change control, prevent others from obtaining substantially all of the benefit of the asset, and obtain substantially all the benefit]".[966] The UNIDROIT Working Group also includes a separate principle on the Identification of a Person in Control of a Digital Asset.[967] That principle includes two important points with which we agree. First, it ought not to be necessary for a person to prove that no person other than the person in control is able to exclude others from the data object and being able to put the data object to the uses of which it is capable. As the UNIDROIT Working Group observes:[968]

> If the control of a person is challenged it would be impossible for the putative control person to prove a negative — that no person other than one permitted by the definition has the relevant abilities.

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963 UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* Principle 6, s (1)(a)(i): https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

964 UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* s (1)(a)(iii): https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

965 UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 19: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

966 UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* Principle 6 s (1)(b): https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

967 UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* Principle 7: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

968 UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 21: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

11.96 Second, the identification mentioned above ought to be by any reasonable means. This could include (but would not be limited to) an identifying number, a private element of a cryptographic key pair — such as a private key, an office, or an account number —, even if the identification does not indicate the name or identity of the person to be identified. The identification could also be in the form of a cryptographic proof. We think this will be important for the preservation of privacy in the future. One example of such a cryptographic proof is Zk-SNARKs. The acronym Zk-SNARK stands for "Zero-Knowledge Succinct Non-Interactive Argument of Knowledge". It refers to a cryptographic proof construction where a prover can prove to a verifier knowledge of certain information, (for example, a secret key), without revealing that information, and without any interaction between the prover and verifier.[969]

11.97 Control, as we intend it in this context, requires only that a person be able "sufficiently" to exclude others from and use of a data object. This is for three reasons. First, it ensures that we do not ask more of data objects than the law asks of tangible objects. As noted above, the concept of possession requires a sufficient, not an absolute, level of exclusive control over the object.[970] The practical excludability of any object will be a matter of degree, and all that the law should require is a sufficient ability to keep others away. This might be important in the contexts of fragile rivalrousness and dynamic excludability by design of certain data objects (which we discuss in detail in Chapter 10).[971] Second, it ensures that parties claiming to be in control of a data object are not faced with the practical impossibility of having to prove a negative — namely, that nobody else has the necessary abilities. Third, it enables parties to control a data object jointly, whether that is because they are acting together in concert, or as part of an arrangement to enhance the security of their holdings (such as a multi-signature arrangement).

11.98 A similar relaxation of the necessary exclusivity of the relevant abilities can be seen in sections (3) and (4) of the UNIDROIT Working Group's Control Principle. The former stipulates that:

> (3) An ability … need not be exclusive if and to the extent that:
>
> > (a) the digital asset or the relevant protocol or system limits the use of or is programmed to make a change of control of the digital asset; or
> >
> > (b) the person in control has agreed or consented to or acquiesced in sharing the ability with one or more other persons.

11.99 The latter stipulates that:

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969 See Zcash, "What are Zk-SNARKs?": https://z.cash/technology/zksnarks/.

970 See para 11.29 above.

971 The Reporter's note to the ULC Committee's definition of "control" acknowledges a similar point: "the powers of a purchaser of a controllable electronic record necessarily are subject to the attributes of the controllable electronic record, records associated with the controllable electronic record, and the protocols of any system in which the controllable electronic record is recorded." See Uniform Law Commission, *Draft - Uniform Commercial Code and Emerging Technologies - 2022 May 16-18 Meeting* p 161: https://www.uniformlaws.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=fa5c6c1b-c612-c453-b39d-8b4e3e8496f3.

(4) In any proceeding in which a person's control of a digital asset is at issue, it is sufficient for that person to demonstrate that the identification requirement … is satisfied as to the abilities specified … It is not necessary for the person to prove the exclusivity of any ability … i.e., that no person other than the person in control and those permitted by paragraph (3) has that ability.

11.100 The Reporter's note to the ULC Committee's definition of control also notes that the definition modulates the exclusivity requirement by explicitly allowing for a person in control to share a power with another person without impairing the exclusivity of the power.[972]

11.101 Given that there are some similarities between our preferred concept of control and the concept of digital possession that we rejected, we consider that it is important that we set out carefully our reasoning for preferring the concept of control. Above, we identified a number of disadvantages to the concept of digital possession. We now make the positive case for the concept of control.

The reasons for preferring control as the operative concept

11.102 Although a new concept of control might be unfamiliar in some ways to the law of England and Wales, our view is that the benefits of a new concept, specifically tailored to the particularities of data objects, outweigh this concern.

11.103 First, a new concept of control better equips the law of England and Wales to deal with data objects that are fundamentally different in nature to tangible assets. Although it is a widely heralded benefit of the common law that it can develop incrementally by analogy, there comes a point where analogies break down and can even prove unhelpful. The types of data objects that we suggest that the law should accommodate into its property regime, simply put, are very different creatures when compared to the types of tangible objects in relation to which the concept of possession has developed.[973]

11.104 Second, a new concept of control could continue to develop in the future with a close and specialised focus on data objects, unburdened by any concern that a particular development might render the concept less useful in its application to tangibles. A new concept of control, therefore, maintains a clear differentiation between the rules for tangibles and the rules for data objects. Control-based rules better suited, and specific to, data objects can be confined to data objects; possession-based rules better suited to tangibles can be confined to tangibles. And the coherence of the wider property system is maintained by the fact that the concept of control is designed to capture the exclusivity aspect of the concept of possession, which itself is based in foundational principles of property rights. In contrast, the risk with a concept of digital possession is that the concept becomes a jack of all asset types, and a master of none.

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[972] See Uniform Law Commission, *Draft - Uniform Commercial Code and Emerging Technologies - 2022 May 16-18 Meeting* p 161: https://www.uniformlaws.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=fa5c6c1b-c612-c453-b39d-8b4e3e8496f3.

[973] "The factual concept of control better describes a holder's powers over these very different kinds of assets": Professor Fox and Professor Gullifer in their response to our digital assets call for evidence.

11.105 This accords with a view expressed by the Centre for Commercial Law, University of Aberdeen, who recommended the development of:

> A third category [of personal property] with a more specialised regime for digital assets. This could draw on existing rules and concepts as appropriate but create bespoke rules where necessary to recognise the special characteristics of (different types of) digital assets. Such an approach would help to integrate digital assets with broader property law while also creating a regime that accommodates the particular issues pertinent to digital assets.

11.106 Additionally, the underlying idea — that new types of assets might be better served by new concepts, rather than by forcing analogies with existing concepts — also aligns with an opinion expressed by Professor Allen in the context of permissionless crypto-token systems:

> Lawyers in both transactional and litigious work and legal scholars should consider carefully what any given operator *actually involves* in the context of open, permissionless DLT systems and adjust the terminology and conceptual apparatus as appropriate. One should prefer 'control' to 'possession' and similar words, for example.[974]

11.107 We think that the flexibility of a new concept of control means that market participants will remain free to structure their arrangements in the ways that best suit them. That might include a combination of the general principles of private property law, (multi-partite) contractual frameworks, trusts, and other legal structuring tools.[975]

11.108 We think that these reasons, particularly when considered against the advantages and disadvantages of extending the concept of possession, sufficiently justify our recommendation for a new operative concept of control. In the next section, we describe how the concept of control will be significant for a variety of different legal concepts.

THE LEGAL SIGNIFICANCE OF A CONCEPT OF CONTROL

11.109 Applying a concept of control, grounded in the factual ability to exclude others from a data object and make use of it, gives rise to a number of legally important consequences. In many cases, these mirror closely the consequences of applying the concept of possession to tangible objects.

(1) **Original acquisition of property rights.** The concept of control provides the law with a grounding mechanism for the analysis of original, or independent, acquisition of property rights in data objects. This is similar to the way in which the unilateral act of taking possession of a tangible object confers upon the possessor a new and original title to the object.[976] As we discuss in Chapter 13,

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974 J G Allen, "Cryptoassets in private law" in I Chiu and G Deipenbrock, *Routledge Handbook of Financial Technology and Law* (2021) p 321 (original emphasis).

975 Many of which are already highly developed in the context of intangible financial instruments.

976 For an insightful discussion of five different mechanisms (including possession) by which the law recognises the creation of a new and original legal interest in a tangible object, see D Sheehan, *The Principles of Personal Property Law* (2nd ed 2017) pp 25 – 28.

we consider that analogies with original or independent methods of acquisition will be important for certain operations or transactions involving crypto-token systems, particularly in the context of mining, validator staking and airdrops.

(2) **Transfers.** The concept of control will be an important building block in the analysis of the legal effect of a transfer of a data object. In Chapter 13 we discuss in more detail how we think the rules of derivative transfer of title would apply to a transfer of a crypto-token by reference to a transfer operation that effects a state change (which itself is likely to effect a change of control).[977] However, it is important to be clear that a change of control is simply a constituent part of the overall analysis as to the legal effect of a transfer of a crypto-token. A change of control may or may not be associated with a transfer of property rights, and the reverse is also true.[978]

(3) **Custody or custody-like arrangements.** The concept of control also plays an important role in facilities and arrangements in which holders relinquish a degree of control over how and by whom their data objects can be used and accessed. This could be done for a variety of purposes, including for increased security, access to liquidity or for yield or revenue generating opportunities. In addition, there also exist multiple examples of crypto-tokens that may derive their market value or functionality from other "linked" crypto-tokens that are subject to (and may be "locked" or "encumbered" within) certain facilities and/or arrangements. In many cases, the holders of those tokens do not simultaneously have direct control over the "locking" or "encumbering" facilities or arrangements. We discuss examples of these type of arrangement in detail in Chapter 16. As we conclude in that chapter, while the concept of control is a helpful analytical tool in relation to these types of arrangement, it needs significant refinement or malleability if it is accurately to apply to the variety of arrangements that are possible. As such, we consider that the broad concept of control might be best thought of as an important constituent element of custody arrangements.

(4) **Collateral arrangements.** In the context of crypto-token collateral arrangements, control can play a useful role in managing fraud risks relating to their execution and operation, as well as facilitating their discoverability by third parties. The concept might thereby fulfil the role (and justify the potential disapplication) of traditional administrative formalities and registration requirements. However, control of crypto-token facilities may be legitimately mediated through automated processes or otherwise qualified and distributed to provide the parties to arrangements with more effective methods for managing the risk and value in collateral holdings and the dealings they secure. Consequently, and as we discuss in more detail in Chapter 18, in identifying and defining the rules that apply to crypto-token collateral arrangements to determine their validity and efficacy against third parties we think that control is

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977 See, in particular, D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.48 on this point.

978 UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 20: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

a useful but limited concept in isolation. In that chapter, we consider whether the validity and perfection conditions for crypto-token collateral arrangements would be more intuitively applicable to a range of facilities if framed by reference to a higher order "provision" principle. Such a higher order principle could help to create facilities or arrangements that were more effective in supporting prudent collateral management techniques and continued innovation in crypto-token markets. We expect that such a higher order principle would incorporate, but would not be defined exclusively by reference to, the concept of control.

(5) **Unlawful interference.** Control can also be used as a basis for identifying a form of interference with a data object. If Bob interacts with Alice's data object such that it is taken out of Alice's control, the law can focus upon the interference with control as the requisite legal wrong that triggers a remedy. A factual example might be Bob maliciously sending an NFT to a "burn address". We discuss how causes of action and associated legal remedies might apply to data objects in more detail in Chapter 19.

(6) **Conflict of laws.** Although it is beyond the scope of this paper, the ability to identify a person in control of a data object at a particular moment in time may be a basis upon which a data object can be ascribed a location for conflict of laws purposes. Norton Rose Fulbright, in response to our call for evidence on digital assets, suggested that a concept like control "is a key conceptual building block in determining the conflict of laws rules that will apply" to data objects.[979] We agreed with Government that we will undertake a project looking at the rules relating to conflict of laws as they apply to emerging technology, including smart legal contracts and digital assets, and consider whether reform is required.[980]

OUR PROPOSALS

11.110 In conclusion, we think that the concept of control, though in many ways equivalent to possession, is the more appropriate concept to apply to data objects. We provisionally propose that the law should adopt the broad concept of control that we describe above.

Consultation Question 16.

11.111 We provisionally propose that the concept of control is more appropriate for data objects than the concept of possession. Do you agree?

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[979] This conflict of laws point was also noted by the Association of Global Custodians – European Focus Committee in their response to our call for evidence.

[980] More information and the latest updates are available at https://www.lawcom.gov.uk/project/conflict-of-laws-and-emerging-technology/.

Consultation Question 17.

11.112 We provisionally propose that, broadly speaking, the person in control of a data object at a particular moment in time should be taken to be the person who is able sufficiently:

(1) to exclude others from the data object;

(2) to put the data object to the uses of which it is capable (including, if applicable, to effect a passing of, or transfer of, that control to another person, or a divestiture of control); and

(3) to identify themselves as the person with the abilities specified in (1) to (2) above.

Do you agree?

How should this be achieved?

11.113 In this chapter we provisionally propose that the concept of control in relation to a data object is functionally similar to the concept of possession in relation to a tangible object.[981] A person in control of a data object stands in the same *type* of factual relationship to that object as does a person in possession of a tangible object. We also set out a broad explanation of what we provisionally propose that control should mean in this context.

11.114 If this approach is generally supported, the next question is how it could best be effected under the law of England and Wales. In Chapter 4, we provisionally propose that the law of England and Wales should explicitly recognise a third category of personal property, distinct from things in possession and things in action. In Chapter 5, we explain the characteristics that we think a thing must have to fall within our proposed third category by setting out a series of criteria. We label those things that satisfy these criteria "data objects". Although we provisionally propose law reform, we set out two options for the development and implementation of our proposals — iterative, common law reform or (limited) statutory intervention. We outline the potential benefits and drawbacks for each, but do not conclude on a preferred option. Instead, we ask consultees for their views.

11.115 We consider that it would be possible to set out the broad factual concept of control described in this chapter in some form of legislation. However, our initial view is that, on balance, it is not necessary or appropriate to do so. We explain the reasoning for this view, and suggest an alternative, below.

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[981] The UNIDROIT Working Group takes the same approach. In describing its principle of "control" is says that "'control' assumes a role that is a functional equivalent to that of 'possession' of movables". See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 20: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

Rivalrousness as a criterion and not control

11.116 Both the UNIDROIT Working Group[982] and the ULC Committee[983] define their concept of a digital asset by reference to the concept of control. Therefore, it makes logical sense that those projects should also go on to define the concept of control. In contrast, and for the reasons we discuss in Chapter 5, we decided not to define data objects by reference to control. Instead, we provisionally conclude that it is more appropriate for the law of England and Wales to focus on the rivalrous nature of an object, rather than its excludability or susceptibility to (exclusive) control. This means that our proposals do not *require* a definition of control as a constituent part of the definition of a data object. Instead, we treat control as a (factual) relationship that a person can have with a data object. As Hin Liu suggests:[984]

> Fundamentally, people do not attach specific consequences to an [object of property rights] that is 'controllable': they only assume the regular consequences of something being [an object of property rights], because control (or exclusive control) is one of the general requirements for title to arise in the first place.

Consistency with the law of possession

11.117 In this chapter we acknowledged the layers of complexity to the concept of possession. While we do not necessarily see this complexity as desirable in the context of data objects, we recognise that the law of possession has remained a flexible and malleable tool for the law of England and Wales. The common law of possession would have been less likely to develop this nuance had possession been defined in legislation. Our proposals treat control as a (factual) relationship that a person can have with a data object — an analogous concept to the concept of possession. Our concept of control is intended to ensure that the law does not ask more of data objects than the law asks of tangible objects. We consider that defining a concept of control in statute would risk undermining that position.

11.118 In Chapter 13, we acknowledge that factual scenarios may arise where multiple persons have a claim to control of a data object, in the same way as multiple persons may have a claim to possession (whether as a matter of fact or law) of a tangible object. There, we suggest that similar rules relating to the relativity and/or priority of competing interests will need to be developed for control as currently exist for possession.[985]

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982 See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 7: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

983 These assets are defined as "controllable electronic records" and include, for example, certain types of virtual currency and nonfungible tokens. See Uniform Law Commission, *Draft - Uniform Commercial Code and Emerging Technologies - 2022 May 16-18 Meeting* p 3: https://www.uniformlaws.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=fa5c6c1b-c612-c453-b39d-8b4e3e8496f3.

984 H Liu, Title control and possession in the digital asset world (2020) Modern Studies in Property Law Conference 2022: https://dx.doi.org/10.2139/ssrn.4079185, at [21] (forthcoming in Lloyd's Maritime and Commercial Law Quarterly).

985 See from para 13.20.

The difficulties with rigid legislative definitions

11.119 As we note above, where the concept of control has been used in legislation and interpreted by the courts (such as the FCARs),[986] it has sometimes led to further confusion. For example, Professors Fox and Gullifer commented in response to our call for evidence on digital assets that

> The concept of control, as [used] by the FCARs and the courts, has caused a great deal of difficulty.

11.120 We do not consider that defining the concept of control in legislation would necessarily reduce uncertainty in the context of data objects. This is for three principal reasons.

11.121 First, precisely defining a concept of control is not an easy task. As we discuss at paragraph 11.97 above, control is a factual concept that necessarily operates at different levels and in differing degrees. Attempting to define the concept in a statute could either risk undermining this flexibility or risk the definition becoming so vague and subject to so many carve-outs that it becomes complex or practically useless (or both).

11.122 Second, we expect that, in the context of data objects, the concept of control is likely to be an evolving concept. For example, the way in which market participants and users interact with data objects — and in particular crypto-tokens — is likely to change over time. Currently, users might combine a variety of different security features such as physical security, hardware wallets, multi-signature arrangements, or custody arrangements. But new safety and security arrangements continue to be designed and tested. For example, social recovery wallets are now available.[987] It is likely that the concept of control will require a high degree of flexibility if it is to continue to apply to these novel arrangements in future. Defining control in legislation could risk undermining this inherent flexibility.

11.123 Third, we consider that the concept of control is often most useful as an important constituent element within a range of higher-level organising or framing principles. For example, and as we discuss in Chapter 16, in relation to custody (or custody-like) arrangements, the concept of control might not be the only determining factor in the legal analysis of the arrangement. Similarly, as we suggest in Chapter 18 in relation to collateral arrangements, the concept of control is unlikely, in itself, to be able to operate as a single, defining and determinative feature of a collateral arrangement. Instead, we see value in recognising that complex and multi-faceted legal arrangements might require the application of a range of complex and multi-faceted legal doctrines, including the concept of control.

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[986] The FCARs do not define the concept of "control". What they do is provide a partial definition for "possession" from which — alongside an analysis of the FCARs and the FCD — the courts have attempted to extract the meaning of and requirements for "control".

[987] Broadly, a social recovery wallet allows for a single "signing key" that can be used to approve transactions, with the added layer of a set of at least 3 "guardians", of which a majority can cooperate to change the signing key of the account. See V Buterin, Why we need wide adoption of social recovery wallets (2021): https://vitalik.ca/general/2021/01/11/recovery.html.

Iterative legal developments

11.124 But if it is not to be defined in statute as the operative concept for those things that fall within our proposed third category, by what mechanism can the law be expected to adopt and develop the concept of control? We consider that the common law will operate as the principal driving force in developing an accurate and nuanced concept of control that can apply to data objects.

11.125 First, we think that the courts will turn to the broad concept of control as a matter of default. The current law says that data objects cannot be possessed, and, for the reasons discussed in Chapter 4, we consider that it is unlikely that the courts will, without further guidance, seek to change that position, particularly given their previous reluctance to do so. The broad concept of control is the only viable alternative, and already is a concept that can apply to both tangible things[988] and intangible things.

11.126 The courts will also be able to draw on, if necessary, analogous case law in other jurisdictions, and the UNIDROIT Working Group's Control Principle, to help them develop the concept of control under the law of England and Wales. Indeed, the UNIDROIT Working Group does not explicitly recommend that Member States adopt a statutory definition of control and frames their Control Principle as a broad guiding principle.

11.127 We consider that this approach is entirely consistent with existing law. The common law has developed the principles of possession (and factual control) over time, in response to market developments and legal challenges. It is able to do so again in the context of data objects. This might also allow legislative reform to focus on highly nuanced and market-specific areas of law such as the provision of custody services or the provision of collateral under common collateral management practices. Those areas are likely to need to use the concept of control as a constituent element within a range of higher-level organising or framing principles. But innovation and incremental development in those areas might be hampered by a rigid, statutory definition of control that could not, in itself, recognise that nuance and market-specificity.

Consultation Question 18.

11.128 We provisionally conclude that the concept of control as it applies to data objects should be developed through the common law, rather than being codified in statute. Do you agree?

Industry guidance and standards

11.129 We do, however, make an additional suggestion on how to facilitate the development of the concept of control, as applicable to data objects under the law of England and Wales. The courts could look to a panel of industry experts, legal practitioners,

[988] As we discuss at para 11.29 above, factual control plays an important role in the concept of possession.

academics and judges to provide non-binding guidance on the complex and evolving issues relating to control (and other issues involving data objects more broadly).[989]

11.130 There are already many parallels with this approach. For example, the UKJT Statement, although non-binding, was integral to the facilitative and principled development of the law of England and Wales (and many other common-law jurisdictions) in respect of crypto-tokens. The UKJT continues to innovate in this area — in 2021 it published the UKJT digital dispute resolution rules.[990] It has proven that innovative, practical and industry-led legal guidance is fundamental for the facilitation and development of novel technology. And, in this vein, Government has also recently announced that it will establish a high-level industry group, the Cryptoasset Engagement Group, to help guide policy development.[991] And as we discuss above, the courts can also draw analogies with developments suggested by international working groups, such as the UNIDROIT Working Group.

11.131 Similarly, in our Report on Electronic Execution of Documents,[992] we concluded that electronic signatures were valid for the vast majority of business transactions and legal processes. Nevertheless, that Report also recognised that numerous uncertainties existed which have hindered the use of electronic signatures and limited the confidence of professionals and individuals in their use. For those reasons, we recommended that a multi-disciplinary group of business, legal and technical experts should be convened to consider the practical and technical issues involved, and to identify potential solutions. The Group's task was to produce best practice guidelines and make proposals for further reform and development. That group published an Interim Report on 1 February 2022.[993] We think that a similar approach would be helpful in the context of the concept of control, and other issues relating to data objects more broadly. Such guidance, while remaining non-binding, should be persuasive for a court with regard to any issue on which views have been expressed in it.

11.132 We consider that this approach strikes the best balance between creating legal market certainty and maintaining the dynamism and flexibility that characterises the law of England and Wales in respect of the facilitation and development of novel technology.

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989 One option for the title of this panel would be the "Control Panel".

990 UK Jurisdiction Taskforce, "Digital dispute resolution rules" (2021): https://lawtechuk.io/explore/ukjt-digital-disputes-rules.

991 See Keynote Speech by John Glen, Economic Secretary to the Treasury, at the Innovate Finance Global Summit during Fintech Week 2022: https://www.gov.uk/government/speeches/keynote-speech-by-john-glen-economic-secretary-to-the-treasury-at-the-innovate-finance-global-summit.

992 Electronic execution of documents (2019) Law Com No 386.

993 Industry Working Group, "Electronic execution of documents interim report" (1 February 2022): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1051451/electronic-execution-documents-industry-working-group-interim-report.pdf.

Consultation Question 19.

11.133 We provisionally conclude that it would be beneficial for a panel of industry, legal and technical experts to provide non-binding guidance on the complex and evolving issues relating to control and other issues involving data objects more broadly. Do you agree?

Chapter 12: Factual transfers of crypto-tokens

INTRODUCTION

12.1 The way in which crypto-tokens are transferred as a matter of fact is idiosyncratic. The mechanism for the transfer of crypto-tokens as a matter of law might therefore also need to recognise this and to be different from the methods and instruments of transfer used to transfer legal title to shares, securities and other registered intangible assets. Equally, the legal mechanism of transfer of crypto-tokens might need to be different from the legal methods of transfer for tangible objects.

12.2 In this chapter we describe the factual nature of a crypto-token transfer. We discuss the concept of a transfer operation that effects a state change within a crypto-token system, including by reference to the related concept of control. We argue that a transfer operation that effects a state change within a crypto-token system will typically involve the replacing, modifying, destroying, cancelling, or eliminating of a pre-transfer crypto-token and the resulting and corresponding causal creation of a new, modified or causally-related crypto-token.

12.3 In the next chapter, we consider the potential legal consequences of a factual transfer operation that effects a state change within a crypto-token system.

FACTUAL TRANSFERS OF CRYPTO-TOKENS

12.4 When a tangible object is handed from one person to another, that object remains generally unchanged. That is, the recipient receives the same object as the transferor had. The recipient takes possession of the object as a matter of fact. What that transfer means as a matter of law will depend on the circumstances: the recipient may become the legal owner, or their interest may be a lesser one with someone else remaining the owner.[994]

12.5 We consider that similar principles apply to transfers of crypto-tokens. Nevertheless, the proper factual and legal characterisation of transfers of crypto-tokens is not entirely straightforward. It is undoubtedly commonplace for participants in crypto-token systems to refer to and (at a non-technical level) understand such transfers as being analogous to the delivery of a tangible physical object.

12.6 However, consistently with the views expressed in the UKJT Statement,[995] we agree that a deeper, more nuanced evaluation of crypto-token transactions suggests that

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994 The legal interest acquired by the act of independently taking possession includes a right to possession, so that someone who independently acquires actual possession of an object thereby acquires legal possession of it — but that may still be subject to someone else with a better interest, including the owner. This could occur where the arrangement is one of bailment or if the object is taken wrongfully. In the latter case, the person in possession acquires a right to possession against the whole world other than the person that they dispossessed and anyone else with better rights than the dispossessed person.

995 UK Jurisdiction Taskforce *Legal statement on cryptoassets and smart contracts* (2019) paras 42-48.

this is not an accurate characterisation of their nature and operation. For context, we think it is worth setting out the UKJT Statement position on this in full:[996]

> How is ownership transferred? That question requires consideration of what actually happens on a transfer. We have said above that a [crypto-token] is functionally represented by a pair of data parameters, with the public parameter containing encoded information about the asset. In order to make a transfer within the [crypto-token] system, the transferor typically modifies the public parameter, or generates a new one, so as to create a record of the transfer (including details of the transferee). The transferor then authenticates the record by digitally signing it with the private key. At that point, the [crypto-token] becomes linked to the private key of the transferee and is therefore under the transferee's exclusive control. Once the transaction is recorded in the ledger, any attempts by the transferor to transfer the [crypto-token] again should not be accepted by the consensus.
>
> A transaction of that kind is sometimes described as on-chain because it is reflected in the ledger or blockchain. Although one can describe and conceptualise the process as a transfer (and that is the word we have used in this Statement), it is not really analogous to the delivery of a tangible object or the assignment of a legal right, where the same thing passes, unchanged, from one person to another. Instead, the transferor typically brings into existence a new [crypto-token], with a new pair of data parameters: a new or modified public parameter and a new private key. The data representing the "old" [crypto-token] persists in the network, but it ceases to have any value or function because the [crypto-token] is treated by the consensus as spent or cancelled so that any further dealings in it would be rejected. The "new" [crypto-token] is represented by new data and controlled by a new key.

12.7 The principal point made by the UKJT Statement is that, unlike in the case of transfer of a physical object, the recipient of a crypto-token "transfer" does not receive the original token in an unchanged state. We consider that the law ought to acknowledge and accept the nuances and idiosyncrasies of the factual way in which crypto-tokens transfer. We think that this is a useful means of providing market participants with both greater clarity and a robust legal foundation for continued innovation in the crypto-token markets.

12.8 Responses to our call for evidence on digital assets suggest that the views of market participants and commentators are not all in complete agreement with the analysis of factual transfers of crypto-tokens set out in the UKJT Statement above. We recognise this divergence of views, but overall agree with the conclusion of the UKJT Statement. Nevertheless, we think it is useful to set out and explain our view in detail.

12.9 In doing so, we consider the nature of crypto-token transactions by reference to crypto-tokens within crypto-token systems that use both UTXO-based and Account-based structures. We also consider crypto-tokens constituted by smart contracts deployed to crypto-token systems (including by reference to both "fungible" and "non-fungible" crypto-token standards, such as ERC-20 and ERC-721). Because we consider our analysis of transfer by reference to different crypto-token implementations, readers may wish to read Appendix 3 and Appendix 6 (which

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996 UK Jurisdiction Taskforce *Legal statement on cryptoassets and smart contracts* (2019) paras 44 to 45.

describe different types of crypto-token implementation at a high level) before this chapter.

Analysis of a factual transfer

12.10 The starting point for our analysis is to consider the technical consequences of a transfer of a crypto-token, as a matter of fact rather than law, within a crypto-token system.

12.11 In the extract at paragraph 12.6 above, the UKJT Statement makes two important points. First, it focuses on the fact that while certain instances of data persist in crypto-token systems following transfer (for example, "spent" or "consumed" UTXO), that data necessarily no longer has the functional or operational qualities that we describe in Chapter 10. Second, it describes a transfer operation within a crypto-token system as typically involving the replacement, modification, destruction, cancellation, or elimination of a pre-transfer crypto-token and the resulting and corresponding causal creation of a new, modified or causally-related crypto-token.

12.12 We consider this analysis in respect of different, broadly categorised implementations of crypto-token systems below.

Bitcoin and other UTXO-based crypto-token systems

12.13 Bitcoin utilises a UTXO-based ledger model. In that model, notional units of account (which are treated by market participants as instances of value) — the bitcoin (BTC)[997] — are represented by the unspent outputs of transactions that have been included in the network's shared, distributed ledger. The data parameters associated with such outputs specify both their value and the criteria for spending them as inputs in future transactions on the network. The associated spending conditions or technical encumbrances might, for example, be based on a certain number of signatures being applied (as is the case with multi-signature arrangements)[998] or the passage of time (by referencing a given block height). These data parameters necessarily change as part of the process for a transaction — so these data structures of manifested data are necessarily different pre and post-transaction.[999] We suggest that this manifested data acquires the characteristics of a thing that can attract property rights when it is instantiated within a crypto-token system such that the data takes on functional/operational properties at a particular time.[1000] We refer to these functional/operational data objects as "crypto-tokens".[1001]

12.14 The crypto-tokens prior to and following a transaction are therefore distinct and different data objects. This is a particular and highly intentional feature of UTXO-

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997 Denominated in integer satoshis.

998 Multi-signature arrangements are also referred to as M-of-N arrangements, with M being the required number of signatures or keys to authenticate an operation and N being the total number of signatures or keys involved in the arrangement.

999 See paras 12.4–12.9 above for further discussion.

1000 See also Chapter 10 paras 10.25–10.30.

1001 As we discuss in Appendix 3 in more detail we accept that the term "token" is not a perfect description for the data objects which are treated by market participants as instances of value in a UTXO-based system.

based crypto-systems' technical implementation for representing notional units of account and their manipulation through transactions.

12.15 Their design means that the same data or information can perform different functions or have different operational qualities in a crypto-token system and these functional or operational qualities may change over time. For example, a UTXO within a UTXO-based crypto-system exists as a form of instantiated data which has informational and operational attributes. But when a UTXO is "spent" or "consumed", the functional or operational attribute of that manifested data is exhausted, while the informational attribute of the UTXO remains. So a "spent" or "consumed" UTXO would no longer be a crypto-token that satisfies our proposed criteria, while the "new" UTXO, as part of a functional/operational data object, would. But the residual informational quality of "spent" or "consumed" UTXO is nonetheless crucial for the functional or operational quality of the new UTXOs that are generated on a transfer.[1002] The transferee will be associated with the UTXO generated as the output of the transaction, which is distinct from the pre-transfer UTXO.

12.16 The UKJT explicitly reference this technical implementation in support of their conclusion that transactions should not be characterised as the transfer of an unchanging thing.[1003] Instead, they characterise a transaction as a change in state of the underlying distributed ledger or structured record, achieved through the consumption of inputs and the creation of new outputs (to the extent recognised and validated by consensus within the crypto-token system).

12.17 We agree with the UKJT's analysis. It is consistent with the approach adopted by legal commentators that have considered the issue from the perspective of specific individual common law-based systems. For example, Professor Fox suggests, by reference to a transaction for the transfer of a quantity of bitcoin between two public keys, pkA and pkB that:[1004]

> The coin representing the input to the transaction at pkA is destroyed and replaced by another coin representing the transaction output at pkB. We should not imagine the data string representing the coin at pkA as being transferred to pkB…Value flows from pkA to pkB by the consumption and creation of distinct informational entities at each public key.

[1002] For example, "sender" addresses are not contained in the transaction information itself. Instead, this information can be constructed by participants that interact with the crypto-token system. The authors of Mastering Bitcoin explain this process: "[A blockchain explorer might show Alice's bitcoin address as the "sender".] In fact, this information is not in the transaction itself. When the blockchain explorer retrieved the transaction, it also retrieved the previous transaction referenced in the input and extracted the first output from that older transaction. Within that output is a locking script that locks the UTXO to Alice's public key hash." A Antonopoulos, *Mastering Bitcoin* (2nd ed 2018) p 146.

[1003] UK Jurisdiction Taskforce *Legal statement on cryptoassets and smart contracts* (2019) para 45.

[1004] D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.18.

> Unlike a physical coin that passes as a continuing thing from payer to payee, the object of the [crypto-token] payment is not the same thing on either side of the payment transaction.[1005]

12.18 A similar conceptual framework was adopted by the New Zealand High Court in *Ruscoe v Cryptopia Ltd (in Liquidation)*.[1006] In that case, Justice Gendall noted that crypto-token transactions operate by the "process of transferring the value inherent in the asset so that one asset becomes replaced by another".[1007]

12.19 Moreover, in the US context, the Uniform Law Commission's Uniform Commercial Code and Emerging Technologies Committee (the "ULC Committee") suggests in its draft amendments to the Uniform Commercial Codethat:[1008]

> In some cases the controllable electronic record that is acquired by the purchaser will not be the "same" controllable electronic record that was transferred by the transferor. Such a transfer might involve the elimination of a "transferred" controllable electronic record and the resulting and corresponding derivative creation and acquisition of a new controllable electronic record. An example of such a resulting controllable electronic record is the unspent transaction output (UTXO) generated by a transaction in bitcoin.

12.20 The UKJT's analysis is also consistent with the approach adopted in a multi-jurisdictional context by reference to general legal principles. For example, the UNIDROIT Digital Assets and Private Law Working Group (the UNIDROIT Working Group) describe a change of control in respect of a digital asset as follows (Paragraph 2 of the Control Principle):[1009]

> A change of control includes the replacement, modification, destruction, cancellation, or elimination of a digital asset and the resulting and corresponding derivative creation of a new digital asset (a "derivative digital asset") which is subject to the control of another person.

12.21 The explanatory notes support the conclusion of the UKJT Statement and suggest that:[1010]

1005 D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.53.

1006 [2020] NZHC 728, [2020] 22 ITELR 925.

1007 *Ruscoe v Cryptopia Ltd (in Liquidation)* [2020] NZHC 728, [2020] 22 ITELR 925 at 117.

1008 The Uniform Law Committee refers to "controllable electronic records", as a sub-set of some digital assets. This definition is similar to our concept of a "crypto-token", albeit it is defined in a different way: https://www.uniformlaws.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=fa5c6c1b-c612-c453-b39d-8b4e3e8496f3 p 3.

1009 See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 19 Principle 6 Definition of 'control' para (2): https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

1010 See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 20.

> Paragraph (2) of [the Control Principle][1011] addresses the situation in which the change of control relates to a derivative digital asset over which control is acquired, inasmuch as the derivative digital asset is not the same digital asset as to which control was relinquished. An example of such a derivative digital asset is the UTXO (unspent transaction output) generated by a transaction in Bitcoin. Another example might be adjustments in balances in accounts resulting from transactions in ether on the Ethereum platform, as to which control is relinquished and acquired over fungible assets that are not necessarily the "same" assets.

12.22 We accept that the idea of bitcoin transactions involving a transfer of notional units of account[1012] and the creation of new, causally-related things might be inconsistent with how they are understood by some users.[1013] However, we do not think that everyday conceptions should necessarily define or be the primary driver for determining the appropriate legal characterisation for a particular crypto-token system, or of the nature of participant interactions undertaken within it.[1014]

12.23 Alternatively, it could be argued that the fact that data representing the corresponding inputs and outputs of transactions are different is merely reflective of how the protocol was implemented at a technical, accounting or operational level. On that basis, there might be merit in an argument that the technical implementation of protocols was not intended to define and should not in itself constrain how transactions on a UTXO-based ledger should be characterised from a private property law perspective.

12.24 However, a review of analytically rigorous commentaries would seem to indicate that the appearance of transaction outputs being new replacement things is not an unconscious, unintended quirk of a particular technical implementation. Rather, it is a means of structuring transactions in a network's native notional unit of account that was deliberately designed that way.

12.25 In *Mastering Bitcoin*, the author explains the operation and nature of transactions on the Bitcoin system as follows:[1015]

[1011] The Control Principle describes how the UNIDROIT Working Group's concept of control is defined and applies to digital assets.

[1012] Which are broadly treated by the market as having some "value". This is how we understand comments from commentators that describe such transfers as transfers of "value" (see para 12.65 below).

[1013] We do however consider that many users of crypto-tokens have a good working understanding of the underlying technology.

[1014] We note, for instance, that the public's perception of bank (deposit) transactions does not constrain their legal characterisation. See *Foskett v McKeown* [2000] 3 All ER 97 (HL), in which Lord Millett at 120, notes that (emphasis added) "*We speak of money at the bank, and of money passing into and out of a bank account. But of course, the account holder has no money at the bank.* Money paid into a bank account belongs legally and beneficially to the bank and not to the account holder… *We speak of tracing money into and out of the account, but there is no money in the account.* There is merely a single debt of an amount equal to the final balance standing to the credit of the account holder. No money passes from paying bank to receiving bank or through the clearing system (where the money flows may be in the opposite direction). There is simply a series of debits and credits which are causally and transactionally linked." See also D Fox, *Property Rights in Money* (2008), in which the author notes at 5.46 that "It is easy to be beguiled by the simple analogy of a transfer of corporeal money made by the delivery of coins and notes and to assume that title to incorporeal money must pass in the same way. This is far from the truth.".

[1015] A Antonopoulos, *Mastering Bitcoin* (2nd ed 2018) p 120.

> A transaction consumes previously recorded unspent transaction outputs and creates new transaction inputs that can be consumed by a future transaction. This way, chunks of bitcoin value move forward from owner to owner in a chain of transactions consuming and creating UTXO.

12.26 Similarly, the research team behind WabiSabi[1016] uses similar language to describe the essential nature of BTC transactions:[1017]

> Bitcoin transactions spend coins as inputs and create new coins output in place of the spent ones.

12.27 "Pour transactions" on Zcash, a privacy-focused crypto-token system with its own native notional unit of account and a UTXO-based ledger model, are presented in the following terms:[1018]

> Coins are spent using the pour operation, which takes a set of input coins, to be consumed, and "pours" their value into a set of fresh output coins — such that the total value of output coins equals the total value of the input coins.

12.28 In relation to UTXO-based ledgers, IOHK (the developer team behind the Cardano protocol) make the following point:[1019]

> In a UTXO accounting model, transactions consume unspent outputs from previous transactions, and produce new outputs that can be used as inputs for future transactions.

12.29 These sources consistently repeat references to transactions involving a transfer of "value" through coins[1020] being "consumed" and "created". In our view, this provides strong support for the proper characterisation of Bitcoin Layer 1 (and other UTXO-based) transactions in native notional units of account as involving the acquisition of a new thing by the transferee. That thing is causally related to, but not the same as, the thing disposed of by the transferor. We accept that this may not be either a "typical" nor "everyday" characterisation of transfers. Nonetheless, we consider that it is important for the legal position to reflect the underlying technological design choices as closely as possible.

12.30 We also recognise that certain market participants are able to track or trace UTXO sets through transactions. For example, the bitcoin taken in the 2016 Bitfinex (a crypto

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[1016] WabiSabi is a particular technical method, or set of rules, which can be followed to structure transactions within the Bitcoin system in a way that helps to enhance the privacy of those transactions.

[1017] Á Ficsór, Y Kogman, L Ontivero and I András Seres, "WabiSabi: Centrally Coordinated CoinJoins with Variable Amounts" (2021): https://eprint.iacr.org/2021/206.pdf.

[1018] E Ben-Sasson, A Chiesay, C Garmanz, M Greenz, I Miersz, E Tromerx and M Virzay, "Zerocash: Decentralized Anonymous Payments from Bitcoin" (2014) IEEE *Symposium on Security and Privacy* 459 at 461.

[1019] See https://iohk.io/en/blog/posts/2021/03/12/cardanos-extended-utxo-accounting-model-part-2/.

[1020] The term "coin" is more commonly used than "token" when describing UTXO-based systems. See also Appendix 3, n 7.

exchange) hack are widely traced.[1021] Because of this, certain market participants (heavily) discount the value of "tainted sets" that are associated with criminal activity.[1022] This was perhaps a wise move, given that the US Department of Justice was able to trace and seize over $3.6 billion in bitcoin taken during the 2016 Bitfinex hack, and arrest two individuals for an alleged conspiracy to launder that bitcoin.[1023]

12.31 On that basis, we recognise that one could make the argument that specific BTC units are indeed transferred on disposal (along with their history). However, we consider that such a conclusion is unsatisfactory. The fact that the transparency of a distributed ledger or structured record may facilitate tracing, or that legal recourse to recover traced value may be available through the law, does not mean that a transfer of specific, unchanged things was intended or has occurred. Instead, we suggest that it is the relevant "chain of value" that is being marked as compromised. Indeed, the law of tracing assumes by definition that the traced subject matter undergoes changes in form.[1024]

12.32 Finally, we recognise that there are a variety of different protocols that allow different users jointly to create a single UTXO based transaction that combines all of their inputs. The transaction can also contain multiple different outputs. Because the inputs and outputs can be from addresses controlled by different persons, this decentralised "mixing" of transactions can provide a greater level of privacy than standard UTXO based transactions.[1025] As Narayanan et al suggest:[1026]

> Somebody looking at this transaction on the block chain – even if they know that it is a [decentralised mixing] transaction – will be unable to determine the mapping between the inputs and outputs. From an outsider's perspective, the coins have been mixed.

12.33 Examples of protocols that facilitate the composition of transactions on this (or a similar) basis are CoinJoin[1027] and Wasabi.[1028] Different privacy-enhancing implementations are available on Account-based crypto-token systems, such as Tornado Cash on Ethereum.[1029]

1021 In an Initial Exchange Offering of LEO Tokens disclosure document, iFinex (Bitfinex) wrote that the exchange continues to implement various strategies for recovery of funds stolen in 2016. See https://www.bitfinex.com/wp-2019-05.pdf.

1022 It has also been suggested by some market participants that "newly minted" bitcoin might attract a premium to older bitcoin, given its lack of a (potentially tainted) transaction history. However, we understand that this might no longer be true (if it ever was) in the market today. See P Sibenik, "Tainted Bitcoin Isn't What You Think It Is" (2021): https://cipherblade.com/blog/tainted-bitcoin-isnt-what-you-think-it-is/.

1023 See https://www.justice.gov/opa/pr/two-arrested-alleged-conspiracy-launder-45-billion-stolen-cryptocurrency and the associated statement of facts, at: https://www.justice.gov/opa/press-release/file/1470211/download.

1024 We discuss how the rules of tracing could apply to transfers of crypto-tokens in more detail in Chapter 19.

1025 See A Narayanan, *Cryptocurrency Technologies: A Comprehensive Introduction* (2016) at 156.

1026 A Narayanan, *Cryptocurrency Technologies: A Comprehensive Introduction* (2016) at 156.

1027 See https://coinjoin.io/home.

1028 Which implements coinjoin transactions via a wallet interface: https://wasabiwallet.io/#faq. See also: https://github.com/zkSNACKs/WabiSabi/blob/master/explainer.md for an explanation of the Wabi Sabi protocol.

1029 See https://tornado.cash/.

12.34 There might be many good reasons why a user would want to enhance the privacy of their transactions.[1030] Given the growing technical and forensic abilities of law enforcement agencies to trace value through privacy-enhancing mechanisms, we understand that the majority of users of such protocols will use them for personal privacy related reasons, rather than for conducting illicit transactions.[1031]

12.35 Regardless of the purpose of any such transactions, it remains clear that a transfer involves a transfer of "value" through coins[1032] being "consumed" and "created". But it is not necessarily always possible to determine which input (consumed coin) relates to which output (created coin).

Ethereum and other Account-based crypto-token systems

12.36 It is important to note that not all crypto-token systems use a UTXO-based system model. For example, Ethereum relies on an Account-based system; instead of tracking and retaining unique references for individually transacted instances of ether,[1033] nodes (system participants) maintain a list of accounts with their corresponding ether balances. In such a system, a transaction is valid if it is composed correctly and the sending account is sufficiently well-funded. On execution of a valid transaction, the specified quantity of ether to be transferred is subtracted from the sending account and is added to the receiving account.[1034]

12.37 As with UTXO-based system transactions, we accept that the idea of ether transactions involving a transfer of value and the creation of new, causally-related things is likely to be inconsistent with their common characterisation by some users.

12.38 However, a review of analytical resources suggests that ether transactions were designed to effect and were intended to operate as a transfer of value (represented by discrete, rivalrous data objects), as opposed to a transfer of specific unchanging things. For example:

[1030] We note that even the privacy-enhancing tools available today may still be susceptible to advanced transaction analysis techniques which can reduce privacy. So we describe these tools as "privacy enhancing", because they do not necessarily provide a user with complete privacy or anonymity.

[1031] For a detailed commentary on this topic, see Former Acting CIA Director Michael Morell's report, An Analysis of Bitcoin's Use in Illicit Finance (2021): https://cryptoforinnovation.org/resources/Analysis_of_Bitcoin_in_Illicit_Finance.pdf. See also the Chainalysis 2022 Crypto Crime Report which suggests that "Transactions involving illicit addresses represented just 0.15% of cryptocurrency transaction volume in 2021 despite the raw value of illicit transaction volume reaching its highest level ever." Chainalysis also note they expect the figure to rise as further illicit transactions are identified. See https://go.chainalysis.com/2022-Crypto-Crime-Report.html. See also the US Treasury Department National Money Laundering Risk Assessment (2022) which states that "The use of virtual assets for money laundering remains far below that of fiat currency and more traditional methods" p 41: https://home.treasury.gov/system/files/136/2022-National-Money-Laundering-Risk-Assessment.pdf.

[1032] The term "coin" is more commonly used than "token" when describing UTXO-based systems. See also Appendix 3 n 7.

[1033] The notional unit of account within the Ethereum system.

[1034] Note, here we refer to "accounts" as externally-owned accounts. The Ethereum protocol also specifies rules related to contract accounts: if the receiving account is a contract, run the contract's code either to completion or until the execution runs out of gas (a unit of computation within the Ethereum system). See V Buterin, The Ethereum Whitepaper: https://ethereum.org/en/whitepaper/#ethereum-accounts.

(1) In *Mastering Ethereum*, the authors make multiple references to ether payment transactions as mechanisms for transmitting or sending value (as opposed to the transfer of a specific thing).[1035]

(2) In explaining the rationale behind adopting an Account-based ledger, the maintainers of the Ethereum Wiki explain that this would enhance fungibility since "there is no blockchain-level concept of the source of a specific set of coins".[1036]

(3) The above explanation aligns with the characterisation of an account and a transfer of ether between accounts in the Ethereum White Paper:[1037]

> In Ethereum, the state is made up of objects called "accounts", with each account having a 20-byte address and state transitions being direct transfers of value and information between accounts.
>
> The key point to understand is that all a currency, or token system, fundamentally is, is a database with one operation: subtract X units from A and give X units to B, with the proviso that (i) A had at least X units before the transaction and (2) the transaction is approved by A.

12.39 In the Ethereum White Paper, Vitalik Buterin goes on to suggest that, in respect of the code for implementing a currency or token system: "This is essentially a literal implementation of the "banking system" state transition function."[1038] We understand this comment to be limited only to the state transition or transaction function within the Ethereum system. As we recognise in Chapter 5 and Chapter 10, crypto-tokens within crypto-token systems are fundamentally different in their legal characterisation to amounts credited to a bank account. An entry in a bank account ledger merely records a debt of an amount equal to the final balance standing to the credit of the account holder.[1039] In contrast, and as we discuss at Chapter 10, the data structure which constitutes a crypto-token (including the data which records account balances) is not a right against another person or obligor (such as a bank). Instead, it has the characteristics of an object of property in itself. It is a data object within our third category of personal property.

12.40 So, a bank account transfer involves a series of debits and credits which are causally and transactionally linked.[1040] If the transfer involves more than one bank, the crediting and debiting of amounts within different accounts (via an extinction and creation of rights) is possible only by relying on complex clearing and settlement

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[1035] A Antonopoulos and G Wood, *Mastering Ethereum* (2018) at 110.

[1036] See "Accounts and not UTXOs" at https://eth.wiki/en/fundamentals/design-rationale.

[1037] V Buterin, Ethereum White Paper (2013): https://ethereum.org/en/whitepaper/#ethereum-accounts.

[1038] Described in the Ethereum White Paper as follows: "In a standard banking system, for example, the state is a balance sheet, a transaction is a request to move $X from A to B, and the state transition function reduces the value in A's account by $X and increases the value in B's account by $X. If A's account has less than $X in the first place, the state transition function returns an error." V Buterin, Ethereum White Paper (2013): https://ethereum.org/en/whitepaper/#ethereum-accounts.

[1039] *Foskett v. McKeown* [2000] 3 All ER 97 (HL) by Lord Millett at 120.

[1040] Above.

infrastructure.[1041] A person's "money in the bank" is "essentially a person's contractual right to compel the bank to pay legal tender in the debt owed to him and to authorise the bank to make payments from the account as agent on their behalf".[1042]

12.41 Similarly, with a transfer within the Ethereum system, a transaction is valid if the sending account has enough balance to pay for it, in which case the sending account is debited and the receiving account is credited with the value.[1043] However, this does not rely on a corresponding extinction and creation of rights, nor inter-bank clearing and settlement infrastructure.[1044] Instead, it relies on a change of state of the distributed ledger within the Ethereum system that is made in accordance with the rules of the system — the system itself functions as settlement infrastructure.

12.42 On that basis, we consider that the proper characterisation of Ethereum Layer 1 (and other Account-based) transactions in native notional units of account involves the acquisition of a new thing by the transferee. As in the UTXO context, that thing is causally related to, but not the same as, the thing disposed of by the transferor. Our reasoning leading up to this conclusion differs between UTXO-based and Account-based systems, but we consider that the characterisation of a transaction is the same in this particular respect.

12.43 We consider that this conclusion is consistent with other legal analysis of this point. In particular, the UKJT Statement's conclusions were expressed as being of general application to on-ledger crypto-token holdings and transfers.[1045]

12.44 Similarly, the UNIDROIT Working Group explicitly describes Ethereum transactions as involving: [1046]

> Adjustments in balances in accounts resulting from transactions in ether on the Ethereum platform, as to which control is relinquished and acquired over fungible assets that are not necessarily the "same" assets.

[1041] Payment effected through a funds transfer system is initiated by a payment order given by the originator, or someone else acting with his authority, to his own bank. In cases where the payment is not 'in-house' (ie the originator and the beneficiary hold accounts at the same bank), the originator's payment order will lead to a further payment order passing between the originator's bank and the beneficiary's bank, sometimes through the intermediation of other banks. The process of exchanging payment orders between participating banks is known as clearing. Clearing may take place through a series of bilateral exchanges of payment orders between banks, but in the United Kingdom it is more common for clearing to take place multilaterally through a centralised clearing house. The major inter-bank electronic funds transfer systems in the United Kingdom are the services operated by BACS Payment Schemes Ltd and Voca Ltd ('BACS') and the payment system run by Clearing House Automated Payments System ('CHAPS') which applies to sterling clearing. J Odgers, *Paget's Law of Banking* (15th ed 2018) paras 22.29-22.30

[1042] D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.29.

[1043] See "Accounts and not UTXOs" at https://eth.wiki/en/fundamentals/design-rationale.

[1044] As we discuss at Chapter 10, this is one of the foundational tenets of decentralised crypto-token systems.

[1045] UK Jurisdiction Taskforce *Legal statement on cryptoassets and smart contracts* (2019) para 45. Given that the UKJT Consultation Paper explicitly described Account-based systems, we understand that the UKJT considered the analysis in respect of Account-based systems as part of their work.

[1046] See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 20.

Crypto-token standards, coloured coins, and tailored arrangements

12.45 In Appendix 3 we discuss how some crypto-tokens are constituted by smart contracts deployed to crypto-token systems. Many different crypto-token "standards" exist — these are a set of rules that a smart contract must follow if it is to be designated as falling within the "standard".[1047] These standards help ensure smart contracts remain composable, so for instance when a new project issues a token, that it remains compatible with existing decentralised exchanges that have built their systems to recognise certain token "standards".[1048] Well known examples are the ERC-20[1049] and Solana SPL token standards, and the ERC-721[1050] and Tezos FA2 token standards (the latter two are commonly used to implement "non-fungible tokens" or "NFTs"). As we discuss in Appendix 3, smart contracts are deployed to crypto-token systems and change the state of the distributed ledger or structured record within the particular crypto-token system. As participants interact with the smart contract, the smart contract operates to update the state of the distributed ledger or structured record within the particular crypto-token system.

12.46 Our view is that it is appropriate to extend the same logic described in paragraphs 12.36 to 12.44 above to this type of crypto-token. We think that the analysis is similar regardless of whether the data that constitutes a crypto-token is recorded only by the state of the distributed ledger or structured record, or by a smart-contract which changes the state of the distributed ledger or structured record. In other words, the law ought to recognise that transactions involving such crypto-tokens typically take the form of ledger entries that themselves follow or are impacted by prior entries and which may be accompanied by varying degrees of technical encumbrances. To the extent that transactions do follow this structure, we consider that it is accurate to characterise such a transaction as involving the acquisition of a new thing by the transferee. Again, that thing is causally related-to, but not the same as, the thing disposed of by the transferor.

"Fungible" token standards

12.47 For the purposes of this discussion, it is helpful to illustrate our point by reference to popular crypto-token standards on Ethereum. In their analysis of the ERC-20 token standard that has been developed for use on the Ethereum system, the authors of *Mastering Ethereum* note that ERC-20 tokens are designed such that "different units... are interchangeable and have no unique properties" and "the ERC20 token standard only tracks the final balance of each account and does not (explicitly) track the

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[1047] A Antonopoulos and G Wood, *Mastering Ethereum* (2018) at 227. See also https://opentezos.com/defi/token-standards/#:~:text=A%20token%20standard%20is%20an,transfers%20on%20the%20Tezos%20network.

[1048] See https://ethereum.org/en/developers/docs/standards/tokens/.

[1049] Token standards are minimum, descriptive standards and each token smart contract is likely to be implemented in different ways. The internal functioning of the smart contract is not relevant to the standard. The ERC-20 token standard is available at https://eips.ethereum.org/EIPS/eip-20. Well-known ERC-20 tokens include Chainlink (LINK), Tether (USDT) and Wrapped Bitcoin (WBTC). The Solana SPL token standard is available at https://michaelhly.github.io/solana-py/spl.html.

[1050] The ERC-721 token standard is available at https://eips.ethereum.org/EIPS/eip-721. Many (but not all) Ethereum-based "NFTs" use the ERC-721 standard for their implementation. The FA2 token standard is available at https://gitlab.com/tezos/tzip/-/blob/master/proposals/tzip-12/tzip-12.md and can be used to implement both fungible and non-fungible tokens.

provenance of any token".[1051] This type of token is sometimes referred to as being "fungible". We discuss the concept of fungibility in more detail in Chapter 15 at paragraph 15.9.

12.48 In our view, it is reasonable to apply the logic of Ethereum Layer 1 (and other Account-based) transactions in native notional units of account to transfers involving ERC-20 (and other "fungible" token standards). Therefore, we think it is reasonable to conclude that an ERC-20 transfer transaction should, as a default rule, be characterised as a transfer of "value" and as involving the causally-related acquisition of a new thing by the transferee.

"Non-fungible" token standards

12.49 The analysis in respect of ERC-721 tokens (and other "non-fungible" token implementations, sometimes referred to as "non-fungible tokens" or "NFTs") is less straightforward. We recognise that the design of the ERC-721 token standard is expressly referred to as "intended to reflect the 'ownership of property'" and the tokens themselves as tracking "ownership of a unique thing".[1052]

12.50 Moreover, the authors of Mastering Ethereum draw a clear distinction between the structural design of ERC-20 and ERC-721 tokens in the following terms:

> To grasp the basic difference between ERC-20 and ERC-721, it is sufficient to look at the internal data structure used in ERC-721… Whereas ERC-20 tracks the balances that belong to each owner, with the owner being the primary key of the mapping, ERC-721 tracks each deed ID and who owns it, with the deed ID being the primary key of the mapping. From this basic difference flow all the properties of a non-fungible token.

12.51 Based on the above, it is fair to suggest that the explicit design decisions behind ERC-721 tokens (and other "non-fungible" token standards) were intended to create distinct and unique objects of property rights. As we discuss in Chapter 15, we agree with the characterisation of ERC-721 tokens (and other "non-fungible" token standards) as distinct and unique objects of property rights — they are data objects that fall within our proposed third category of personal property.

12.52 However, we do not think that it is inconsistent with this analysis to conclude that an ERC-721 (and other "non-fungible" token standards) transfer transaction should also, as a default rule, be characterised as involving the causally-related acquisition of a new thing by the transferee. In the case of ERC-721 tokens, the new, causally-related thing will remain a distinct and unique object of property rights. Moreover, that new thing will have a clear transaction history. It will also contain an internal dataset, which may be linked to an external dataset. As we discuss in Chapter 14, the new, causally-related thing may or may not be linked to a thing or legal rights that are external to the crypto-token system. The difference is that the new, causally-related crypto-token will contain an internal/external dataset that persists through the transaction.[1053]

[1051] A Antonopoulos and G Wood, *Mastering Ethereum* (2018) at 227.

[1052] Above.

[1053] For more detail, see Chapter 15 at paras 15.18 to 15.24.

Depending on the way a thing or legal rights that are external to a crypto-token have been linked to the particular crypto-token, the link might also persist through the transaction.

12.53 We consider that the language used by the UNIDROIT Working Group in respect of a change of control would be wide enough to capture the transfer of a non-fungible token. Even if it is not correct to say that the non-fungible token is destroyed, cancelled or eliminated on transfer, we consider that a transaction would at least effect a modification of that token:[1054]

> A change of control includes the replacement, modification, destruction, cancellation, or elimination of a digital asset and the resulting and corresponding derivative creation of a new digital asset (a "derivative digital asset") which is subject to the control of another person.

12.54 Notwithstanding the above analysis, we think that the law should leave room on the basis of principles of freedom of contract, for characterising particular transaction arrangements as transfers of an identifiable and persistent thing, *even though* the crypto-token itself is modified or extinguished on transfer. This would mean that the law remains as consistent as possible with the general market perception of a "non-fungible" token being a unique object that persists through transactions. We think that this could be achieved through external legal contractual arrangements, or within a smart contract or a crypto-token's meta-data. Market participants are already beginning to do this. For example, the licence terms and conditions for Otherdeed specifically refer to the operation of the Otherdeed smart contract. The Otherdeed terms therefore implicitly recognise the factual function of the Otherdeed smart contract but make it clear that the Otherdeed NFT is intended to "persist" through a transfer:[1055]

> 'Otherdeed' means a non-fungible, unique token (NFT) on the Ethereum blockchain that, as of its genesis issuance, contains a link to a unique image ('Art'). Each owner of an Otherdeed ('Owner') has the non-exclusive right to use, copy and display the Art linked to his/her Otherdeed to the extent that such use, copy or display *results from the operation of the smart contract related to the Otherdeed*…(emphasis added)

12.55 We think that the law can facilitate such flexibility in the following way. First, the law should recognise that the transfer of a crypto-token typically involves the replacing, modifying, destroying, cancelling, or eliminating of a pre-transfer crypto-token and the resulting and corresponding causal creation of a new, modified or causally-related crypto-token. Second, participants should, through the use of specific provisions or commonly accepted standards, be able to attribute specific importance to an individual crypto-token, such as a particular NFT (including any modification or causally-related instance thereof, following a transfer). In addition, participants should be able to define

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[1054] See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 19 Principle 6 Definition of 'control' para (2): https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

[1055] See https://otherside.xyz/license.

the outcome and effect of a particular transaction mechanism, for example, by specifying in a contractual agreement how they agree that they will treat a factual transfer of a crypto-token. Participants should be able to do this irrespective of the default rules applying to the characterisation of transactions in a network's native notional unit of account or the model adopted by smart contract standards deployed to the network.

12.56 So, in other words, the law can recognise that crypto-tokens are (at least) modified on transfer. But the law can also recognise that that the mere fact that a crypto-token uses a particular "non-fungible" token standard (or has a "serial number" or other identifier) does not, in itself, grant special importance to said crypto-token. Instead, the law should retain its flexibility to facilitate parties' express recognition of the distinctiveness of a particular crypto-token, and its ability to be tracked in some manner (even through transactions which modify it). For example, in Chapter 19 we discuss how the law of tracing (as opposed to following) is the more appropriate evidential process to be applied to crypto-tokens (including NFTs) and the possible actions and remedies that could apply in the case of misappropriated crypto-tokens.

12.57 By way of further example, Bitcoin (and certain other UTXO-based systems) are designed not to permit the deployment of smart contracts. This means that it may not be possible to use a smart contract to designate specific instantiations of data to create a "non-fungible token". Instead, it is possible for some industry participants to "colour" UTXO sets (by embedding some identifier in the associated meta-data), including for the purposes of purportedly tracking specific off-chain object(s). So UTXO sets could be "marked" or "coloured" to track a specific car or collectible that is of interest to a subset of network participants.[1056] Importantly, these UTXO sets are able to preserve the designated "marked" or "coloured" meta-data following a transfer to another network participant, facilitating their identification.

12.58 In the above example, we think it remains consistent to refer to coins[1057] represented by UTXO sets being "consumed" and "created". However, notwithstanding the consumption and creation of UTXO sets, the metadata that was given a specific importance by a subset of network participants persists through transactions.

12.59 Similarly, the transfer of an NFT involves (at least) the modifying of the pre-transfer NFT and the resulting and corresponding causal creation of a new, modified or causally-related NFT. This modification is effected by the smart contract updating its mapping of the specific NFT token ID to refer to the address of the transferee. Nevertheless, the metadata of the NFT constituted by the smart contract token implementation normally persists through the transfer. So in some cases, the law will need to balance the fact that a "new" or causally-related NFT has been created on transfer, with the fact that the important elements of the NFT (such as the internal/external information set) persist through a transfer. We discuss this delicate balance in more detail in relation to derivative transfers of title of a crypto-token in

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[1056] See https://academy.bit2me.com/en/what-is-a-colored-coin/. See also https://en.bitcoin.it/wiki/Colored_Coins.

[1057] The term "coin" is more commonly used than "token" when describing UTXO-based systems. See also Appendix 3 n 7.

Chapter 13, in relation to NFTs in Chapter 15 and in relation to causes of action and associated remedies in Chapter 19.

12.60 Finally, a crypto-token could be linked to external legal rights, as we discuss in Chapter 14. For example, an ERC-20 token could be linked to a debt security. A transfer of the ERC-20 token will, as we suggest above, involve the acquisition of a new (or modified) and causally-related ERC-20 token by the transferee. However, how that technical state of affairs translates to a transfer of the linked external legal rights will be determined by the legal characterisation of that link and the (explicit or implicit) choices of the parties involved.

Consultation Question 20.

12.61 We provisionally conclude that a transfer operation that effects a state change within a crypto-token system will typically involve the replacing, modifying, destroying, cancelling, or eliminating of a pre-transfer crypto-token and the resulting and corresponding causal creation of a new, modified or causally-related crypto-token. Do you agree?

12.62 We provisionally conclude that this analysis applies in respect of UTXO based, Account based and token-standard based (both "fungible" and "non-fungible" crypto-token implementations). Do you agree?

A TRANSFER OPERATION THAT EFFECTS A STATE CHANGE

12.63 As we suggest above, a transfer operation within a crypto-token system will typically involve the replacing, modifying, destroying, cancelling, or eliminating of a pre-transfer crypto-token and the resulting and corresponding causal creation of a new, modified or causally-related crypto-token. Typically, a transfer operation will result in the imposition or creation of varying degrees of technical encumbrances in respect of the crypto-token (most commonly, the association of the crypto-token with the receiving public key address). The possibility to impose or create such technical encumbrances within a crypto-token system make it possible for a person (or smart contract) to have a factual relationship of control with a crypto-token. It is typically also possible for that person (or smart contract) to divest themselves of the factual relationship of control with the crypto-token.[1058] In general, this will be effected by the technical completion of a transfer operation in accordance with the protocol rules of the relevant crypto-token system. So in typical cases, a transfer operation that effects a state change will result in a change of control.

12.64 The transfer operation, once confirmed, will also result in a change of state of the distributed ledger or structured record in accordance with the protocol rules of the crypto-token system. We use the terms state and change of state to refer to the canonical and chronological order of transactional events as recorded within the transaction-based ledger or record of a crypto-token system. For example, in the

[1058] We discuss in detail in Chapter 11 why we think it is appropriate for the law of England and Wales to develop a factual concept of control that can be applied to a data object, including a crypto-token.

Ethereum White Paper, Vitalik Buterin refers to Bitcoin as a "state transition system":[1059]

> From a technical standpoint, the ledger of a cryptocurrency such as Bitcoin can be thought of as a state transition system, where there is a 'state' consisting of the ownership status of all existing bitcoins and a 'state transition function' that takes a state and a transaction and outputs a new state which is the result.

12.65 He goes on to describe the state of Ethereum as follows:

> In Ethereum, the state is made up of objects called 'accounts', with each account having a 20-byte address and state transitions being direct transfers of value and information between accounts.[1060]

12.66 We therefore refer to changes of state and a transfer operation that effects a state change in this chapter. We also note that a change of state or a transfer operation that effects a state change does not necessarily happen instantaneously in crypto-token systems.[1061] In addition, it may take some time for the transfer operation that effects a state change to become probabilistically irreversible.[1062]

Factual consequences of a transfer operation that effects a state change

12.67 Above, we make three observations relating to the factual consequences of a transfer operation that effects a state change within a crypto-token system:

(1) such a transfer operation will typically involve the replacing, modifying, destroying, cancelling, or eliminating of a pre-transfer crypto-token and the resulting and corresponding causal creation of a new, modified or causally-related crypto-token;

(2) such a transfer operation will typically involve the imposition or creation of varying degrees of technical encumbrances in respect of the causally-related crypto-token, which will typically amount to a change of control as between the pre-transfer crypto-token and the causally-related crypto-token; and

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[1059] See https://ethereum.org/en/whitepaper/#ethereum-state-transition-function.

[1060] Above.

[1061] Unconfirmed transactions are stored by nodes (system participants) in a memory list called a memory pool, or transaction pool. Nodes use this pool to keep track of transactions that are known to the network but are not yet included in the distributed ledger or structured record. A number of variables, such as the fee included in the transaction data structure affect when the transaction will be included in the distributed ledger or structured record. See A Antonopoulos, *Mastering Bitcoin* (2nd ed 2018) ch 6.

[1062] Within crypto-token systems, transactions effected by entries on the distributed ledger or structured record are not described as achieving "empirical finality". Instead, they are referred to as becoming "probabilistically irreversible". This is because it may be theoretically or mathematically possible to modify or reverse a transaction retroactively. For some systems, this is only possible temporarily (based on our current technology), because the probability of a transaction being reversible decreases the more blocks are added on top of the block containing the transaction. See L Gullifer, R Hay, "How final is final? Settlement finality, blockchains and DLT" (2020) 1 *Journal of International Banking and Financial Law* 8, 8.

(3) such a transfer operation will typically result in a change of state of the distributed ledger or structured record in accordance with the protocol rules of the crypto-token system.

12.68 In the following chapter, we consider the potential legal consequences of a transfer operation that effects a state change within a crypto-token system.

Chapter 13: Legal transfers of crypto-tokens

INTRODUCTION

13.1 In this chapter, we discuss issues relating to the legal consequences of a transfer of a crypto-token by a transfer operation that effects a state change.

13.2 First, we argue that the state of the distributed ledger or structured record should not necessarily be regarded as a definitive record of (superior) legal title to a crypto-token.

13.3 Second, we discuss original and derivative transfers of title in the context of crypto-token systems. We make the case that the legal rules on derivative transfers of title can apply to crypto-tokens within crypto-token systems, notwithstanding that a transfer operation effecting a state change will typically result in the causal creation of a new, modified or causally-related crypto-token. We consider how the rules of derivative transfer of title can be applied to such transfers, including in the context of the unauthorised disposition of a crypto-token.[1063] We go on to identify areas of uncertainty and potential deficiencies that we consider could be addressed through legislative reform. In particular, we provisionally propose an explicit clarification that the special defence of good faith purchaser for value without notice should apply to crypto-token transactions.

13.4 Third, we argue that the concept of control will be important in the context of crypto-token transfers for three related, but distinct, reasons:

(1) As a constituent part of a transfer operation that effects a state change.

(2) On the assumption that the rules of derivative transfer of title can be applied to transfers of crypto-tokens, for situations in which (superior) legal title to a crypto-token is separated from the factual control of a crypto-token.

(3) For the purposes of applying rules relating to priority of interests, particularly in the context of disputes over title and for the purposes of collateral arrangements.

In other words, we consider that control plays an important (although not determinative) role in the overall analysis as to the legal effect of a transfer of a crypto-token.

13.5 We conclude this chapter by discussing possible analogies with existing methods and mechanisms of legal transfers of other things to help explain the differences between such transfers and legal transfers of crypto-tokens.

13.6 Our starting point when characterising the legal analysis of such a transfer is that our analysis applies only to the crypto-token itself. We acknowledge that a crypto-token

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[1063] We discuss how the rules of tracing, causes of action and associated remedies could apply to transfers of crypto-tokens in Chapter 19.

might be linked to something else — often a thing external to a crypto-token system. But the legal effect of a transfer of a crypto-token on the external thing to which it is linked will depend on how the link between the crypto-token and the linked thing is constituted and on rules[1064] specific to that type of linked thing. We discuss these issues in more detail in Chapter 14.

Legal title and the state of the distributed ledger or structured record

13.7 It is helpful to begin with an analysis of the legal effect of the state of the distributed ledger or structured record in a crypto-token system. We discuss the terms state and state change in this context in more detail in Chapter 12.[1065]

13.8 We agree with the conclusion of the UK Jurisdiction Taskforce, Legal Statement on cryptoassets and smart contracts ("UKJT Statement") that the state of the distributed ledger or structured record should not necessarily be regarded as a definitive record of legal title to a crypto-token.[1066] The state of the distributed ledger or structured record "may provide a definitive record of the links between discrete transactions within the [crypto-token] system, but it cannot be a record of their legal effect".[1067] In other words, it is a factual, as opposed to a legal, account of the world.

13.9 The legal system is necessarily external to a crypto-token system: the state of the crypto-token system is not therefore constitutive of a participant's legal title to any particular crypto-token. The state of the crypto-token system merely records the factual situation; that is, it shows with which address a particular crypto-token is associated. It also records (and enforces) the technical encumbrances and conditions that regulate how crypto-tokens associated with that address can be used or spent (for more detail on this point see Chapter 10 and Appendices 3 and 6).

13.10 As we suggest in Chapter 14, the state of the distributed ledger or structured record could only be treated as a definitive record of legal title or legal rights if a statute were to provide that it had that legal effect.[1068] This might be possible or desirable in certain, limited, use cases such as a registry system for land or specific physical goods.[1069] But it is unlikely to be either possible or desirable in the context of the vast majority of crypto-token systems, particularly those that are open, permissionless, and decentralised.

13.11 Alternatively, participants in a crypto-token system (or under a separate contractual framework) could contractually agree that the state of the distributed ledger or structured record will be treated as the definitive record of legal rights or title as

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1064 Including any formalities requirements.

1065 From para 12.63.

1066 UK Jurisdiction Taskforce, *Legal Statement on cryptoassets and smart contracts* (November 2019) paras 46 and 131–134: https://technation.io/lawtechukpanel/ ("UKJT Statement").

1067 D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.49.

1068 See also UKJT Statement para 132.

1069 Land is a helpful usecase because it does not move and (in general) remains under the jurisdiction of a single state and legal system.

between the participants within that system.[1070] Theoretically, a crypto-token system as a whole could do this. A crypto-token system could opt out of the application of the general rules of property law altogether if all users of the system agreed to disapply those rules. As Professor Fox suggests:[1071]

> There would need to be a system-rule to this effect, which users accepted when they made transactions on the system. Only then could the blockchain record be constitutive of a person's title to the [crypto-token].

13.12 We suggest that there are very good reasons why open, permissionless, and decentralised crypto-token systems do not do this.[1072] Not least because participants in those systems recognise that the law has an important role to play in the formation, validity, and acceptance of the social layer that is fundamental to the success of any crypto-token system. The law can also mediate and ameliorate conflict through a comprehensive, flexible, and nuanced application of rules and precedent that would be difficult to replicate in full at a technical level.

13.13 Although the state of the distributed ledger or structured record is not likely to provide a definitive record of legal title to a crypto-token, it will provide strong evidence of legal title. Below, we consider the ways in which legal title can be acquired by original acquisition or by derivative transfer of title and apply those concepts to crypto-tokens and crypto-tokens systems. We go on to consider how the concept of control will be important in the context of legal transfers of a crypto-token.

ACQUISITION OF TITLE

Independent acquisition of title

13.14 The law recognises various ways in which a person can acquire an independent (new or original) legal interest in an object of property rights, which is not dependent or derivative on the (partial) transfer of a pre-existing legal interest. As Dr Douglas puts it (in the context of tangible things):[1073]

> [Dependent acquisition] is to be contrasted with the case of independent acquisition, where the party acquiring the right acquires a new and original right in the [tangible thing]. There are a number of apparently unrelated events which can generate a new property right in a [tangible thing]. The most important of these methods of independently acquiring a property right is the taking of physical possession.

[1070] UKJT Statement para 134. We agree with the observation of the UKJT in this context that private contractual arrangements cannot override certain mandatory rules on ownership and legal title that apply on insolvency.

[1071] D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.49.

[1072] We anticipate, on the other hand, that some permissioned, centralised systems are more likely to take this approach.

[1073] S Douglas, *Liability for Wrongful Interference with Chattels* (2011) p 29.

13.15 Although they can be grouped and sub-divided in various ways, the law generally recognises five different mechanisms for acquiring a new and original legal interest in an object:[1074]

(1) **Accession by natural means**. When one thing is produced by another by natural means, the person with the best legal interest in the first acquires the same interest in respect of the second. For example, the owner of a pear tree owns the pears that it produces.

(2) **Accession**. When objects become fixtures or accessions — that is, when they are merged or accede into some other object — the person with the best legal interest in the greater and more valuable object gets the best legal interest in the attached lesser object. For example, when paint is applied to a canvas (such that it cannot be removed), the painter acquires ownership over the canvas. In Roman law, this is called *accessio*.[1075]

(3) **Specification**. When an object is turned by labour into something else, the labourer acquires the best legal interest in the new thing. For example, when the ingredients of a cake are combined to make a cake, the maker of the cake gets the best legal interest in it. In Roman law, this is called *specificatio*.[1076]

(4) **Commingling**. When two quantities of fungible objects (belonging to two different persons) are mixed together either in a way that cannot be readily undone (like mixing together fluids; in Roman law, *confusio*),[1077] or where it can be readily undone (like mixing together different grains; in Roman law, *commixtio*),[1078] the parties will jointly have the best legal interest (divided in an appropriately proportionate way).

(5) **Possession**. When a party unilaterally acquires possession of an object, they acquire a legal interest (but not necessarily the best legal interest) in the object. In Roman law, the term *occupatio* is used specifically to refer to the taking of possession of a previously unowned thing (like a wild animal).[1079]

13.16 In this paper we do not consider in detail how original or independent methods of acquisition apply to crypto-tokens. However, we consider that analogies with original or independent methods of acquisition will be important for certain operations or transactions involving crypto-token systems. For example, we consider that mining a crypto-token (either in a proof of work or a proof of stake system) would result in a new, independent acquisition of the crypto-token that the miner or staker receives as

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[1074] See also S Douglas, *Liability for Wrongful Interference with Chattels* (2011) p 29.

[1075] Institutes of Justinian Book 2 Title 1 paras 33–34.

[1076] Institutes of Justinian Book 2 Title 1 para 25. See further E Lorenzen, "Specification in the Civil Law" (1925) 35(1) *The Yale Law Journal* 29.

[1077] Institutes of Justinian Book 2 Title 1 para 27.

[1078] Institutes of Justinian Book 2 Title 1 para 28.

[1079] See, for example, Institutes of Justinian Book 2 Title 1 para 12.

part of the block reward, possibly as a form of *occupatio*.[1080] Similarly, it is possible that crypto-tokens received as part of an airdrop could be acquired by original or independent acquisition, depending on the structure of the airdrop.[1081]

Derivative transfers of title

13.17 The majority of legal interests that persons acquire in objects of property rights are said to be dependent or derivative. That is, a person who acquires an object does not normally acquire a new, original interest in that object. Instead, a person will receive by transfer the pre-existing interest of another (for example, through a sale or by taking delivery of a gift), or acquire some lesser interest, carved out of the better interest of another (as when a person becomes a pledgee).[1082] That person's rights will not be independently acquired rights to the object, but instead rights that derive from the rights of others. Dr Douglas explains this as follows (in the context of tangible things):[1083]

> In the case of a dependent acquisition the party acquiring the right acquires a pre-existing property right in the [tangible thing] from another person. Such an acquisition can occur in one of three ways: by deed, delivery or sale. In each case, the transferee must intend [their legal interest] to pass to the transferee.

13.18 These concepts are however more difficult to apply to intangible things. Nevertheless, we consider that these general rules of derivative transfer of title would apply to a transfer of a crypto-token by a transfer operation that effects a state change.[1084] We think, therefore, that a transfer operation that effects a state change is a necessary but not sufficient condition for transfer of (superior) legal title to a crypto-token under the law of England and Wales. We note however that some commentators have suggested that a transfer of control (as opposed to a transfer operation that effects a state change) should instead be the threshold test and ask consultees on their views

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[1080] Note, however, that, for tax purposes, such an original acquisition is likely to be treated as income in England and Wales. See HRMC, "Cryptoassets manual: CRYPTO40200 - Cryptoassets for businesses: mining transactions": https://www.gov.uk/hmrc-internal-manuals/cryptoassets-manual/crypto40200. See also https://www.gov.uk/government/consultations/call-for-evidence-the-taxation-of-decentralised-finance-involving-the-lending-and-staking-of-cryptoassets. The treatment of crypto-tokens for tax purposes is outside the scope of this paper. Note also that this type of original acquisition will not apply to all arrangements described by market participants as "staking". See Cobie, "ApeCoin and the death of staking" (April 2022), for a discussion on the different types of arrangements that are now referred to by market participants as "staking": https://cobie.substack.com/p/apecoin-and-the-death-of-staking?s=r.

[1081] An airdrop is an unsolicited distribution of an allocation of crypto-tokens, normally for free. For example, airdrops have been used as of marketing or advertising campaigns in which certain persons are selected to receive certain allocations of tokens.

[1082] In a pledge, the pledgor transfers various elements (but not all) of their property interest to the pledgee, including the right to possession: S Douglas, *Liability for Wrongful Interference with Chattels* (2011) p 37.

[1083] S Douglas, *Liability for Wrongful Interference with Chattels* (2011) p 28. Dr Douglas speaks of the need for an intention to transfer "ownership", but he uses this term in quite a specialised way because his view is that ownership is the only type of property interest "relating to a [tangible thing] that can be said to exist with any degree of certainty": p 20.

[1084] See, in particular, D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.48 on this point.

on this point below (see Question 26).[1085] A related consequence of this reasoning is that a transfer by deed or bill of sale[1086] would not be possible for legal transfers of crypto-tokens. We discuss this in more detail at paragraph 13.130 below and ask a question on this point at Question 26. We also discuss analogies with a transfer by delivery at paragraph 13.147.

13.19 We consider that the rules of derivative transfer of title can apply to crypto-tokens. This is notwithstanding the argument (with which we agree) that a transfer of a crypto-token by a transfer operation that effects a state change involves the acquisition of a new, causally-related thing by the transferee.[1087]

13.20 In the context of transfers of money, Professor Fox considers whether the derivative acquisition of a new, causally-related thing by the transferee means that derivative transfer of title rules should not apply to incorporeal money. His reasoning is worth setting out in full:[1088]

> On one view, it would be incorrect to speak of a transfer of incorporeal money since it might not conform with the long-held distinction between original and derivative means of acquiring title. But … incorporeal money can indeed be transferred. To speak of incorporeal transfers gives full effect to the principle that the law should aim for functionally equivalent outcomes regardless of whether money is paid in corporeal or incorporeal form. Moreover, on a closer investigation, the principle of derivative transfer of title can never have entailed that the payer's possession or ownership of a corporeal asset actually passed, physically, to the recipient. That would be to take an extreme, and unrealistic, approach to the reification of property interests.
>
> On balance…it is justifiable to treat the incorporeal transfer [of money by means of an inter-bank payment] as involving a derivative means of acquiring title. First, the creation of the recipient's title depends on the expression of the payer's will at the outset. It is the payer who initiates the payment instruction. Secondly…the fact that the recipient's claim against his or her bank is newly created does not necessarily entail that he or she takes it free from competing titles.
>
> Indeed, it would take an extreme and unrealistic conception of derivative means of acquiring title to sustain the view that transfers of incorporeal money should be treated differently from corporeal transfers. Even in the simplest case of a transfer of

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1085 See Professor Louise Gullifer QC, "The private law of digital assets: what is it and what should it be?", Gray's Inn Annual Birkenhead Lecture (15 November 2021): https://www.graysinn.org.uk/app/uploads/drupal-media/documents/education/The%20private%20law%20of%20digital%20assets%2017.11%20-%20Birkenhead%20Lecture.pdf. Professor Gullifer refers to "a change of control", which could be taken to be wider than a transfer operation effecting a state change. See also H Liu, "Title control and possession in the digital asset world" (2022) *Modern Studies in Property Law Conference 2022*: https://dx.doi.org/10.2139/ssrn.4079185 (forthcoming in Lloyd's Maritime and Commercial Law Quarterly).

1086 A bill of sale is a document that transfers ownership of goods from one person (A) to another in circumstances where A retains (or can retain) possession of the goods. The equivalent in the context of crypto-token would be A retaining control over the crypto-token.

1087 For more detail on this argument, see Chapter 12.

1088 D Fox, *Property Rights in Money* (2008) paras 1.101, 1.106 and 1.107.

ownership by delivery of a chattel, the network of jural relations constituted by the transferee's possession and ownership of the chattel is different from that constituted by the transferor's former possession and ownership.[1089] The transferee does not in fact succeed to the same possession and ownership as the transferor. Possession and ownership are legal constructs. Unlike the corporeal assets they relate to, they cannot be transferred in space from one person to another.

13.21 We consider that this line of reasoning can be extended to the transfer of intangible crypto-tokens where such a transfer is effected by a transfer operation that effects a state change. We also think that the concepts of possession described by Professor Fox in the passage above can also apply by analogy to our concept of control over data objects.

13.22 Our starting point is that such a transfer is a necessary but not sufficient condition for the transfer of (superior) legal title to a crypto-token. We suggest that a transfer operation that effects a state change is not sufficient in itself to transfer (superior) legal title for two broad reasons. First, in general, a transferor can confer no better title to a transferee than they are able to give. Second, the transaction between the transferor and the transferee must be legally valid in terms of the common law and equitable rules governing derivative transfers of title.[1090] We consider these issues below. In particular, we consider the extension of the special defence of good faith purchaser for value without notice to transfers of crypto-tokens by a transfer operation that effects a state change.

NO ONE CAN GIVE WHAT THEY DO NOT HAVE — THE *NEMO DAT* PRINCIPLE

Rights, interest, and title

13.23 In this section we look at a general principle of the law of England and Wales which is traditionally expressed in Latin as follows: *nemo dat quod non habet.* It is sometimes referred to as the "*nemo dat*" principle. The *nemo dat* principle is "the basic rule in relation to title in English law … that no one can give what they do not have".[1091]

13.24 We explain the principle and its exceptions in more detail below. However, it is helpful first to distinguish between three related concepts: rights, interests, and title. This will help to explain why the *nemo dat* principle is often expressed as the rule that a person cannot transfer better *title* to an asset than they have themselves.

13.25 McKendrick explains the differences between rights, interest, and title in the following way:[1092]

[1089] Referencing WN Hohfeld, *Fundamental Legal Conceptions* (1964), ch 2 and WW Buckland, *Textbook of Roman Law*, 3rd edition by P Stein (1963) at 204.

[1090] D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.48.

[1091] M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 31-002.

[1092] E McKendrick, *Goode on Commercial Law* (5th ed 2016) para 2.21 (emphasis added).

> A person's *interest* in an asset denotes the quantum of *rights* over it which he enjoys against other persons, though not necessarily against all other persons. His *title* measures the strength of the interest he enjoys in relation to others.

13.26 Similarly, the authors of *The Law of Personal Property* suggest that:[1093]

> A person's *'interest'* in an asset must necessarily fall within one of the recognised instances of property *right* (ownership of goods, special property of pledgee, hirer under a chattel lease), with the rights, powers and other incidents applicable to that type of interest. The *'title'* to that interest relates to its strength or quality, which could be absolute, qualified, or defective.

13.27 Having clarified these distinctions, we can appreciate why the *nemo dat* principle is commonly expressed as a rule relating to title, rather than as a rule concerning interests in objects of property rights. The principle is routinely deployed in the context of disputes involving objects of property rights. As these disputes normally involve competing claims to objects of property rights, and because their resolution necessitates a close analysis of the nature and strength of the competing claims, the successful party will be the one who can establish the best title to the object. Accordingly, these types of dispute are commonly referred to as "title conflicts".[1094] However, interests and title are closely connected concepts. Saying that no one can transfer an interest in an asset that they do not have, and saying that no one can give better title to an asset than that which they have themselves, are two ways of expressing the same idea.

The *nemo dat* principle in more detail

13.28 In general, Bob can take no better title to an object of property rights than Alice had to give.[1095] That is because a person's title to an object of property rights is generally derived from the previous owner.[1096] When the object is transferred, the title that once vested in Alice simply passes to Bob with the result that Bob cannot acquire better title than the title Alice had.[1097]

13.29 So, if a car is stolen by a thief, the thief has a bare possessory interest in the car, but the victim retains a superior title. If someone buys the car from the thief, they cannot acquire that superior title to the car because the seller — the thief — did not have it to give. All the buyer can acquire is a bare possessory interest in the car (the best interest that the thief had). The victim would be entitled to recover the market value of the car from the innocent buyer, even if the buyer did not know that the car they bought was stolen and did not know that they did not acquire the best legal interest

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1093 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 1-058 (emphasis added).

1094 For example, chapter 31 of M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021), which discusses the *nemo dat* principle, is titled "Title Conflicts and Priorities".

1095 K F K Low and E Teo, "Legal Risks of Owning Cryptocurrencies" in D Lee and R Deng, *Handbook of Blockchain, Digital Finance, and Inclusion*, (2017) vol 1 p 225.

1096 See D Carey Miller, *The Acquisition and Protection of Ownership* (1986) pp 117–120 and FH Lawson and B Rudden, *The Law of Property* (2nd ed 1981) ch 4. As we discuss above, there are some situations in which original acquisition of title occurs.

1097 D Fox, "Bona Fide Purchase and the Currency of Money" (1996) 55(3) *Cambridge Law Journal* 547.

(the superior title) in the car. The *nemo dat* principle is codified in law in relation to goods by section 21(1) of the Sale of Goods Act 1979. As a general principle, it is subject to equitable and common law defences and statutory exceptions.[1098]

13.30 The exceptions to the *nemo dat* principle are complex. They are.

(1) Statutory exceptions to the *nemo dat* principle in the context of goods (or documents of title to goods).[1099] Generally, these rules enlarge the power of (i) mercantile agents, (ii) those who have agreed to buy goods; and (iii) those who have sold goods but retain possession to pass title in those goods to good faith purchasers.[1100] We do not consider these exceptions directly, because we argued at paragraph 13.135 below that the Sale of Goods Act 1979 does not apply to data objects, including crypto-tokens.

(2) The common law defence of good faith purchaser for value without notice that applies to money. This rule creates a fresh, indefeasible legal title in a transferee who receives money in good faith and for value. The common law defence operates to make the transferee immune from the claim (legal or equitable) of any previous holder who might otherwise have retained a property interest in the money.[1101]

(3) The common law defence of good faith purchaser for value without notice that applies to negotiable instruments such as bills of exchange and promissory notes.[1102] In essence, the rule operates much like the above exception. It creates a fresh, indefeasible legal title in a transferee (a "holder in due course") who takes the negotiable instrument in good faith and for value, and without notice of any defect in the title of the person who negotiated it. Possession of the negotiable instrument is required for a holder to enforce the contracts on the negotiable instrument.[1103]

(4) The equitable principle of good faith purchaser for value without notice. This principle operates such that an equitable interest in an object of personal property is extinguished as against the purchaser of a legal interest to the object if they are a good faith purchaser for value without notice of the equitable interest.[1104] The good faith purchaser of the legal interest takes free of the equitable interest.

[1098] See also our discussion in the context of theft and fraudulent acquisition of crypto-tokens in Chapter 19 at para 19.125.

[1099] Originally contained in the various Factors Acts, culminating in the Factors Act 1889 and now contained in the Sale of Goods Act 1979, s 24 (Seller in possession after sale), s 25 (Buyer in possession after sale) s 47 (Effect of sub-sale etc. by buyer), s 48 (Rescission: and re-sale by seller).

[1100] M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 31-012.

[1101] D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.59.

[1102] *Miller v Race* (1758) 1 Burr 452, *Clarke v Shee* (1774) 1 Cowp 197. Bills of Exchange Act 1882, s 29.

[1103] See M Bridge, L Gullifer, K Low, and G McMeel, The Law of Personal Property (3rd ed 2021) para 26-004 and onwards for more detail on the categories of "holder" and the types of possession required.

[1104] See J McGhee, *Snell's Equity* (34th ed 2019) paras 4.017 to 4.041.

(5) The same equitable defence also applies to a purchaser of an equitable interest as against a mere equity.[1105] So, a mere equity in an object of personal property is extinguished as against the purchaser of an equitable interest in the object if they are a good faith purchaser for value without notice of the pre-existing equitable interest.[1106] The good faith purchaser of the equitable interest takes free of the pre-existing mere equity.

Application of current law to crypto-tokens

13.31 The application of the *nemo dat* principle and its exceptions to crypto-tokens is unclear. It is complex, hard to apply, and not appropriate for modern commerce involving crypto-token systems.[1107] We discuss ways in which the *nemo dat* principle and its exceptions might apply to crypto-tokens below. We then propose law reform to clarify the position.

Starting point

13.32 The starting point is that when someone with an interest in a crypto-token transfers that crypto-token to another person by a transfer operation that effects a state change,[1108] the interest that once vested in the transferor will pass to the transferee. The result is that the transferee will generally acquire no better title than the transferor had.[1109] The normal rules of property law will apply to determine whether (superior) legal title passes to the transferee.

13.33 For example, a transfer made by a person who had limited legal capacity would be void or voidable, depending on the nature of the limited capacity. If it were void, the starting point would be that the transferor would retain their legal title to the thing. If it were voidable, then the legal title would pass to the transferee, but the transferor might be free to rescind the transfer and cause the (superior) legal title to the object to revert to them.[1110]

13.34 A similar analysis would apply where a transferor's intention to transfer is vitiated. If the defect in the transferor's intention were so fundamental that it rendered their intention legally ineffective, the transfer would be void (and the superior legal title would not pass to the transferee). On the other hand, if the transferor's intention to transfer its legal title to a transferee were vitiated to a less fundamental extent, then it is likely that superior legal title to the object would pass. In that case, the transferee

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[1105] In general, a mere equity is a claimant's inchoate (imperfectly formed) right to rescind or to claim an equitable interest which is binding on specific property. That inchoate (imperfectly formed) right will transform into an equitable proprietary claim (an equitable interest) if and when the person chooses to enforce it. In other words, the person must perform some other legal act to cause their mere equity to crystallise as an equitable interest. See J McGhee, *Snell's Equity* (34th ed 2019) para 2-006.

[1106] See J McGhee, *Snell's Equity*, 34th edition (2019) paras 4.017 to 4.041.

[1107] M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 31-002 (in the context of the *nemo dat* principle and its exceptions generally).

[1108] Note for these purposes we assume that a transfer operation that effects a state change will also involve a simple change of control over the crypto-token from Alice to Bob.

[1109] D Fox, "Bona Fide Purchase and the Currency of Money" (1996) 55(3) *Cambridge Law Journal* 547.

[1110] D Fox, *Property Rights in Money* (2008) para 3.06.

would take the legal title in the object subject to a right of proprietary rescission in the transferor.[1111]

13.35 Broadly, examples of where (superior) legal title will not pass include where a thief steals an object outright, where there has been a fundamental mistake in a transfer, or when the transferor lacked the mental capacity to make a valid legal transfer.[1112] In those cases, even though the transferee might not obtain (superior) legal title to the crypto-token, the transferee might nonetheless obtain control over the crypto-token in question. We consider that control over the crypto-token would operate in a similar way to possession of a tangible thing. The transferee would, as a consequence of their control, obtain a control-based interest in the crypto-token which was good against the world except for the transferor (or anyone else with a (superior) legal interest, such as the victim from whom the transferor appropriated the token).[1113] The transferor or victim would retain the (superior) legal title to the crypto-token, even though it did not retain control over the crypto-token.[1114]

Statutory exceptions to the *nemo dat* principle in the context of goods

13.36 As we discuss below at paragraph 13.135, we provisionally conclude that it is not legally correct or practically appropriate to treat crypto-tokens as "goods" or as analogous to "goods" within the meaning of the Sale of Goods Act 1979.[1115] On that basis, the statutory exceptions to the *nemo dat* principle in the context of goods that are contained in the Sale of Goods Act 1979 do not apply.

The common law defence of good faith purchaser for value without notice that applies to money

13.37 As we note above, the common law defence of good faith purchaser for value without notice that applies to money works to create a fresh, indefeasible legal title in a transferee who receives money in good faith and for value. The effect of this rule is to modify how the *nemo dat* principle applies in the contexts of certain transfers of money.

13.38 The common law rule of good faith purchaser for value without notice would only apply to a crypto-token if the common law characterised that crypto-token as money.[1116] In addition, the parties to the transaction would need to choose to characterise the crypto-token as money, rather than as some investment commodity

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1111 D Fox, *Property Rights in Money* (2008) paras 3.06 to 3.07.

1112 See B Haecker, "Proprietary Restitution after Impaired Consent Transfers: A Generalised Power Model" (2009) 68 *Cambridge Law Journal* 324-360: "only few defects are serious enough to nullify the transferor's intention altogether. They prevent title passing." See also D Fox, *Property Rights in Money* (2008) paras 3.06 to 3.07.

1113 Where no common law defence of good faith purchaser for value without notice applied.

1114 This paper does not consider in detail the various consequences of derivative transfers of title as the law is complex and highly fact-dependent. For a detailed study of this area of law, see D Fox, *Property Rights in Money* (2008).

1115 Or the Supply of Goods and Services Act 1982.

1116 D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.60.

bought with conventional state-denominated currency (or acquired in some other way).

13.39 The characterisation of crypto-tokens as money or otherwise is outside the scope of this consultation paper. However, we make three observations on the point. First, the debate on whether a crypto-token is "money" has, in large part, focused on a specific sub-set of crypto-tokens over the last few years, rather than on crypto-tokens as a whole.[1117] Second, whether a crypto-token (or specific crypto-token) is characterised as money is likely to depend on the law of the particular jurisdiction in question and this characterisation might not be consistent across different jurisdictions.[1118] Third, "the property regime applying to money is just one of a number of legal devices by which the state can support the efficiency of monetary functions".[1119] It is therefore less accurate to ask "are crypto-tokens money?" than to ask the specific question as to whether the law is able to characterise crypto-tokens as something that should enjoy a privileged proprietary status which other kinds of assets or things do not enjoy. This question can be asked separately for each distinct "legal device" by which the state can support the efficiency of monetary functions.

13.40 For the time being, crypto-tokens denominated in their own notional unit of account are unlikely to count as money for the purposes of the common law good faith purchaser rule in England and Wales, particularly if the parties to a transaction treat them as investment commodities.[1120] Note that we discuss the interpretation of the statutory definition of "cash" under The Financial Collateral Arrangements (No. 2) Regulations 2003 and consider its potential application to different forms of crypto-token in Chapter 18. We also discuss actions for an agreed sum and, separately, "monetary" awards in more detail in Chapter 19. On that basis, we do not think that the common law defence of good faith purchaser for value that applies to money applies to crypto-tokens.

[1117] This is in part because the first use cases for crypto-tokens were, to a greater or lesser extent, as a means of exchange, a store of value or a unit of account. While some crypto-tokens are still primarily used for these purposes, crypto-tokens now have many different use cases. In particular, they are no longer confined to "money" or "money-like" use cases, and most jurisprudence, regulatory, and legal commentary in respect of crypto-tokens treats them as objects of property rights, without answering the question as to whether they are or can be money.

[1118] For example, El Salvador and the Central African Republic have made bitcoin legal tender: S Perez, C Ostroff, "El Salvador Becomes First Country to Adopt Bitcoin as National Currency" (September 2021): https://www.wsj.com/articles/bitcoin-comes-to-el-salvador-first-country-to-adopt-crypto-as-national-currency-11631005200.

[1119] See D Fox, *Property Rights in Money* (2008) at 2.09.

[1120] D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.66.

The defence of good faith purchaser for value without notice that applies to negotiable instruments

13.41 The common law defence of good faith purchaser for value without notice that applies to negotiable instruments[1121] modifies how the *nemo dat* principle applies in the contexts of certain transfers of negotiable instruments.

13.42 What counts as a negotiable instrument depends on statute and mercantile usage.[1122] In the absence of mercantile custom leading to a document becoming a negotiable instrument at common law, a statute would be required explicitly to specify that an instrument was negotiable. It would be very difficult to argue that mercantile custom has arisen to date such that crypto-tokens should be treated as negotiable instruments.[1123] And there is no current statute which provides that a crypto-token is a negotiable instrument.

13.43 It seems clear then that a crypto-token is not a negotiable instrument, as that term is currently understood. This interpretation aligns with the view of the UKJT Statement, which made the following nuanced observation:[1124]

> We cannot see any reason as a matter of principle why intangible property could not become negotiable. So long as it is possible to transfer title to property, it ought to be possible for either a statute or the custom of merchants to treat property as negotiable. But as the law currently stands, we do not think that [crypto-tokens] are negotiable in the sense in which the term is generally used.

13.44 The UKJT Statement suggested that the characterisation of crypto-tokens as non-negotiable was unlikely to be important in practice. This is because of the argument, with which we agree, that a transfer of a crypto-token by a transfer operation that effects a state change in the ledger creates a new thing, causally-related to the old thing. The logical consequence of this argument for the UKJT was therefore that a fresh, indefeasible legal title to a crypto-token is created in a transferee following a transfer operation that effects a state change.

13.45 We instead argued at paragraph 13.19 above that, notwithstanding the technical characteristics of a transfer operation that effects a state change, the normal rules of derivative transfer of title still apply to crypto-tokens. The rules of derivative transfer of title apply to payments through bank payment systems, notwithstanding the fact that an inter-bank transfer does not involve the passage of one, unchanging thing, but instead involves a series of debits and credits which are causally and transactionally linked. At paragraph 13.124 below, we also suggest that a transfer of a crypto-token is closely analogous with a novation, but that it is not exactly the same. Therefore, analogies with "transfer" of title to securities by novation do not completely explain the

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[1121] This term is used here in the narrow sense: to denote instruments capable of being held by a good faith purchaser for value without notice (a holder in due course), as opposed to the broader meaning sometimes employed to describe those documents of title transferable by delivery without indorsement.

[1122] For a more detailed discussion on this point, see Chapter 14.

[1123] Even if mercantile custom has arisen in respect of some crypto-tokens, it is perhaps unlikely to have arisen in respect of crypto-tokens as an amorphous class.

[1124] UKJT Statement para 123.

argument[1125] that rules on derivative transfer of title ought not to apply to crypto-tokens.

13.46 If this analysis is correct, it would mean that the argument of the UKJT Statement that a fresh, indefeasible legal title to a crypto-token is created in a transferee following a transfer operation that effects a state change would not apply. On that basis, we consider that the characterisation of a crypto-token as being able to benefit from the defence of good faith purchaser for value without notice is likely to be more important.

The equitable principle of good faith purchaser for value without notice

13.47 An equitable interest in any kind of object of personal property rights is extinguished against the purchaser of the legal title in the object, if that purchase is in good faith, for value and without notice of the equitable interest. Our view is that this principle applies to transfers of crypto-tokens, in the same way as it applies to other objects of property rights.[1126] Further, we consider that it applies regardless of whether the crypto-token is characterised as money, a negotiable instrument, or some other thing.

13.48 Professor Fox provides an example of how this rule would operate in the context of crypto-tokens:[1127]

> If Alice held her 5 [bitcoins] on trust for Carol but transferred them in breach of trust to Bob, then Bob would hold the output of the transaction free of Carol's equitable claim, provided that he was a purchaser for value without notice.[1128] The same reasoning would apply if the 5 [bitcoins] held by Alice were the proceeds of a fraud she had earlier perpetrated against Carol. Carol's right of proprietary rescission and restitution of the coins would be barred if Bob received them for valuable consideration and without notice of Carol's claim.

13.49 This point is very important in the context of crypto-token systems. It is not always the case that a hacker or a thief will obtain a crypto-token from an innocent person without their consent.[1129] As well as hacks and theft, there are numerous reports of frauds, scams, and social-engineering attacks in which the victim consents to transfer, or shares their ability to control, their crypto-token(s). In those circumstances, it is likely that the perpetrator would obtain good legal title to the crypto-token(s), subject to the victim's equitable claim or mere equity against the perpetrator.[1130] However, that

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1125 Implicit, although not explicit, in the UKJT Statement's analysis.

1126 D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.58.

1127 Above.

1128 Above.

1129 See eg Crystal Blockchain, "Crypto & DeFi Hacks & Scams Report" (2021) p 7: https://crystalblockchain.com/security-breaches-and-fraud-involving-crypto/.: "So far, $3.18 billion has been stolen through security breaches, $7.12 billion has been stolen through scams, and $1.76 billion through DeFi hacks." Note that the term stolen might be used in a colloquial sense and the particular factual matrix might have different legal implications in different types of case.

1130 J McGhee and S Elliott, *Snell's Equity* (34th ed 2021) para 2-006, referring to *Daly v Sydney Stock Exchange Ltd* (1986) 160 CLR 371; *Shalson v Russo* [2003] EWHC 1637 (Ch), [2005] Ch 281. See also See B Haecker, "Proprietary Restitution after Impaired Consent Transfers: A Generalised Power Model"

equitable interest would be extinguished against a subsequent good faith purchaser for value without notice. The point might also be important in the context of custody arrangements that utilise a trust structure. In those cases, the custodian could (likely in breach of trust) transfer the crypto-tokens subject to the trust to another person. The equitable interest under the trust would, in those circumstances, be extinguished against a subsequent good faith purchaser for value without notice.

Confirming the application of the common law good faith purchaser defence

13.50 As far as the law currently stands, we do not consider that crypto-tokens[1131] benefit from the common law defence of good faith purchaser for value without notice, because they are almost certainly neither money nor negotiable instruments. That said, this would not prevent the courts from developing a similar defence by analogy with the existing defences applicable to money or negotiable instruments. This would not necessarily be a completely novel argument or development — indeed, as we note at paragraph 13.58 below, an argument based on similar reasoning has been made in the context of the dematerialisation of money market instruments for over 20 years.[1132]

13.51 Nevertheless, as far as we are aware, there is no existing authority on this point in the law of England and Wales. This could lead to a level of uncertainty for the market.[1133]

13.52 We think that the best way to avoid any lingering uncertainty as to the application of the common law defence of good faith purchaser for value without notice is explicitly to recognise its application in relation to transfers of crypto-tokens.[1134] We set out our arguments in favour of this approach below. We think that this would be a useful development for the law of England and Wales. We provisionally propose that the common law special defence of good faith purchaser for value without notice, currently applicable to money and to negotiable instruments, would also apply to a transfer of a crypto-token by a transfer operation that effects a state change. We refer to this explicit extension as an "innocent acquisition rule", as shorthand. We set out our reasoning in support of our proposal below, followed by further detail on its suggested scope.

13.53 We envisage that this proposed law reform would only extend to a transfer of a crypto-token by a transfer operation that effects a state change. Whether the special defence

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(2009) 68 *Cambridge Law Journal* 324-360 and D Fox, *Property Rights in Money* (2008) paras 3.06 onwards for more detailed discussion on these issues.

1131 We do not distinguish between protocol-level crypto-tokens and other implementations of crypto-tokens (such as ERC-20 or ERC-721 tokens) for the purposes of this argument. However, we consider that the argument is slightly stronger for protocol-level implementations and other implementations of crypto-tokens that are treated as "fungible" by market participants.

1132 However, this analogy can only be taken so far given that dematerialisation of money market instruments involved the creation of new statutory provisions and the corresponding legal interpretation of those provisions.

1133 To the extent that the market does not agree with the UKJT position that a fresh, indefeasible legal title to a crypto-token is created in a transferee following a transfer operation that effects a state change.

1134 This argument was also put forward by Professor Cutts, who suggested a narrow legislative provision which would protect good faith purchasers for value without notice. See T Cutts, "Crypto-Property? Response to Public Consultation by the UK Jurisdiction Taskforce of the LawTech Delivery Panel" (June 2019) *LSE Policy Briefing 36* pp 5 to 6.

would apply such that a transferee would also "take free" of any linked thing would be a separate question. The answer to that question would depend on, among other things, the applicable law, the contractual framework between the parties, and the nature of the "link" between the crypto-token and the external thing.

Arguments in favour of a general "innocent acquisition rule" in respect of crypto-tokens

Existing market expectations by application of UKJT Statement reasoning or by analogy with negotiable instruments

13.54 It is possible that market participants expect that an innocent acquisition rule already applies to the transfer of crypto-tokens by a transfer operation that effects a state change. Alternatively, market participants might consider that the idiosyncratic nature of a transfer operation that effects a state change means that the practical consequences of an innocent acquisition rule already apply.

13.55 This expectation of market participants is likely to derive, in part, from the conclusions of the UKJT Statement that "We do not think the [*nemo dat*] principle applies in the case of [crypto-tokens]" and that "The general [*nemo dat*] rule does not anyway apply to a [crypto-token] because each on-chain transfer creates new property with a new title".[1135]

13.56 Moreover, we consider that there are good reasons why market participants might conclude that a transfer of a crypto-token by a transfer operation that effects a state change is analogous to the transfer of a negotiable instrument.

13.57 We think that an analogy between crypto-tokens, crypto-token systems and existing dematerialised systems is helpful in this respect. As we discuss in more detail in Chapter 14, in dematerialised systems such as CREST, the thing that constitutes or evidences title to the security (the register) is different from the instruments that must be used to transfer that title. The instrument of transfer is a "properly authenticated dematerialised instruction" attributable to the relevant "system-member".[1136] We understand that in that limited context, transfers of dematerialised securities are treated as providing at least equivalent integrity and finality of title for a transferee as would be acquired by a transferee of a corresponding negotiable instrument held outside the CREST relevant system.[1137]

13.58 In the context of preparation for the dematerialisation of the UK's money markets, a number of arguments were put forward in support of this position. The overall

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[1135] UKJT Statement paras 47 and 124.

[1136] Uncertificated Securities Regulations 2001 reg 35.

[1137] In their response to our call for evidence, the City of London Law Society ("CLLS") noted that: "In connection with the dematerialisation of the UK's money markets, CRESTCo Limited (the former name of EUI) and the Bank of England consulted leading counsel, Richard Sykes QC, on this point of equivalence of finality and integrity of title in respect of money market instruments to be converted into uncertificated form under the Uncertificated Securities Regulations 2001 (USRs) and held in the CREST relevant system. [Richard Sykes QC] concluded that the scheme for the transfer of such instruments, as registered 'eligible debt securities' with the protections afforded to transferees under regulation 35 of the Uncertificated Securities Regulations 2001, would provide at least equivalent integrity and finality of title for a transferee as would be acquired by a transferee of a corresponding negotiable instrument held outside the CREST relevant system", referring to Bank of England, "The Future of Money Market Instruments: A Consultation" (1999) Appendix II: https://studylib.net/doc/8778983/the-future-of-money-market-instruments.

argument was that "the inherent features of a dematerialised instrument to some extent reproduce characteristics of negotiability".[1138] We accept that this argument was made in the context of references to explicit legislation in the form of the Uncertificated Securities Regulations 2001 and therefore is stronger than the argument in respect of crypto-tokens to which similar legislation does not apply. However, we think that the same argument could be applicable in the context of crypto-tokens and crypto-token systems.

13.59 First, as we discuss at paragraph 13.63, a transfer of a crypto-token within a crypto-token system by a transfer operation that effects a state change will involve a transfer without the need for a separate written instrument.[1139] Accordingly, holders of crypto-tokens would, in this respect, be in the same position as holders of negotiable instruments (where transfer can be effected by physical delivery).

13.60 Second, it is important to consider the question of whether a transferee of a crypto-token would be significantly more exposed to claims based on alleged prior defects in title than a holder in due course of a negotiable instrument. In the context of paper-based negotiable instruments and dematerialised securities, the issue can arise in a number of situations. Some examples are: (i) where there has been a defective issue by the drawer; (ii) where there has been a forged transfer of an instrument; and (iii) where there have been conflicting dispositions by the owner of an instrument.[1140]

13.61 In a fully paper-based system, a holder in due course is treated as having good title to a negotiable instrument because, in general, the holder of a bearer instrument is the person in actual possession of it. This is the case even where a negotiable instrument was previously lost or stolen. Similarly, a holder in due course may also be treated as having good title to a negotiable instrument under which the drawer's signature has been forged, at least as against the acceptor and any endorser of that instrument.[1141]

13.62 In the context of dematerialised securities, Richard Sykes QC concluded that a transferee under the CREST system is in at least as good a position as a person to whom a paper instrument is negotiated.[1142] That conclusion was based on, among other things, the fact that "a transfer which was made as a result of a forged properly authenticated dematerialised instruction could not be reversed".[1143] This means that a transferee or a subsequent good faith purchaser would take good title, even where the

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[1138] Bank of England, "The Future of Money Market Instruments: A Consultation" (1999) p 28: https://studylib.net/doc/8778983/the-future-of-money-market-instruments.

[1139] See the corresponding argument in relation to dematerialised securities in "The Future of Money Market Instruments: Bank of England, "The Future of Money Market Instruments: A Consultation" (1999) p 28: https://studylib.net/doc/8778983/the-future-of-money-market-instruments.

[1140] Bank of England, "The Future of Money Market Instruments: A Consultation" (1999) p 28: https://studylib.net/doc/8778983/the-future-of-money-market-instruments.

[1141] By virtue of ss 54(2)(a), 55(2)(b) Bills of Exchange Act 1982.

[1142] See Bank of England, "The Future of Money Market Instruments: A Consultation" (1999) Appendix II: https://studylib.net/doc/8778983/the-future-of-money-market-instruments.

[1143] See Bank of England, "The Future of Money Market Instruments: A Consultation" (1999) Appendix II: https://studylib.net/doc/8778983/the-future-of-money-market-instruments. We accept that the argument was also based on an analysis of the Uncertificated Securities Regulations 2001 and so was stronger in the context of the dematerialised securities in question.

transfer was effected as result of a properly authenticated dematerialised instruction which was shown to be forged or unauthorised.

13.63 Although there is no specific statutory framework on which to base this argument, the position in crypto-token systems is similar. A transfer of a crypto-token by a transfer operation that effects a state change will take effect within the crypto-token system regardless of whether the "true" holder "authorised" the transaction. All that is needed is for the transaction to be validly composed and confirmed in accordance with the protocol rules of the crypto-token system. For crypto-tokens, this issue is most likely to arise where there has been a fraudulent transfer of a crypto-token (for example, where a perpetrator gained control of a crypto-token and transferred that crypto-token without the consent of the true holder).

13.64 So, instead of a statutory framework which regulates transfers, transfers are regulated by the rules of the crypto-token system itself. In general, the protocol rules of decentralised crypto-token systems ensure that changes to the state of the distributed ledger or structured record are append-only. In other words, once a state change has become probabilistically irreversible,[1144] it is not practically possible to go back and amend the distributed ledger or structured record.[1145] This is the case even in respect of fraudulent transfers — the crypto-token system does not, and will not, distinguish between such transfers; that is a feature of its design. Similarly, while certain centralised or permissioned crypto-token systems may permit reversals of transactions, the practical ability to do so is likely to be highly constrained by a mixture of economic incentives, legal agreements, and social or network pressure.

13.65 We consider that it is important to preserve the existing expectation of market participants in respect of their dealings with crypto-tokens. We think that there could be a perception in the market that either an innocent acquisition rule applies in respect of crypto-tokens[1146] or that the practical consequences of an innocent acquisition rule already apply.[1147] On that basis, we think that the inclusion of an explicit innocent acquisition rule at law in relation to crypto-tokens would provide certainty on this point.

Economic reasons for prioritising sanctity of transactions over property rights in crypto-tokens

13.66 One of the core reasons for the special defence of good faith purchaser for value without notice in respect of money and negotiable instruments is that the rules promote security of transactions over security of property rights.[1148]

[1144] We discuss the concept of a transfer of a crypto-token becoming "probabilistically irreversible" in more detail at Chapter 12 n 1062.

[1145] For more detail on this point, see A Antonopoulos, *Mastering Bitcoin* (2nd ed 2018) ch 9.

[1146] By analogy with the existing special defence of good faith purchaser for value without notice.

[1147] Following the reasoning in the UKJT Statement.

[1148] D Fox, *Property Rights in Money* (2008) para 2.11. See also M Franklin, "Security of Acquisition and Transaction" (1931) 6 *Tulane Law Review* 589; G Gilmore, "The Commercial Doctrine of Good Faith Purchase" (1954) 63 *Yale Law Review* 1057; and L Ellis, "The Transfer of Moveables by a Non-Owner" (1980) 55 *Tulane Law Review* 145.

13.67 The law of property effectively has to choose whether to protect the overriding need to facilitate the free circulation of money and the transferability of negotiable instruments, or the property rights of the (former) owner. The effect of the law of property choosing to prioritise the sanctity of transactions is that a greater onus is placed on holders of objects of personal property rights to ensure that their things are not taken from them or transferred away without proper authority. This mirrors the onus that is placed on personal autonomy by market participants within the crypto-token space.[1149] Professor Fox suggests a number of justifications for this approach in the context of money, some of which we think also apply by analogy to crypto-tokens and crypto-token systems.

13.68 First, Professor Fox notes that transaction costs will generally be reduced if a good faith purchaser for value without notice does not need to make extensive inquiries into the transferor's title. The expense of inquiring into a transferor's title would otherwise become an "information cost" of a transaction, which would likely be reflected by market participants in the price they were willing to pay for the object.[1150] In the context of pseudonymous crypto-token systems, even extensive inquiries into the validity of title of a recorded holder might not reveal the true nature of that person's title. In that respect, market participants might be driven to discount the value they were willing to pay for a particular crypto-token.

13.69 Second, Professor Fox makes the following point:[1151]

> The proprietary regime applying to money does not so much build trust between the parties as it makes the possible absence of trust less relevant. In the ordinary course of events, the recipient of money who gives good consideration can be assured of taking an indefeasible title to it…The currency principle thus supports what has been called the "anonymity" of money, and its role in facilitating impersonal relations between market agents.

13.70 We think the point applies by analogy particularly well to crypto-token systems. Crypto-token systems are explicitly designed to facilitate impersonal relations between market agents that do not trust each other directly, but are nonetheless willing to transact within the rules of the crypto-token system. Given the fundamental importance of this proposition to crypto-token systems, the justification for the currency rule seems equally applicable to crypto-tokens and crypto-token systems.

13.71 Of course, a property law regime that favours transaction sanctity over personal property rights leads to the inevitable result that the title of the (former) holder of the object of property is rendered more vulnerable.[1152] The (former) holder of the object of

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[1149] For a detailed consideration of autonomy within the crypto-token space, see R Grassman, V Bracamonte, M Davis, M Sato, "Attitudes to Cryptocurrencies: A Comparative Study Between Sweden and Japan" (2021) *The Review of Socionetwork Strategies*, 15(1):169 to 194: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7966896/.

[1150] Assuming an efficient market. See D Fox, *Property Rights in Money* (2008) para 2.14.

[1151] D Fox, *Property Rights in Money* (2008) para 2.18.

[1152] An approach generally more favoured in civil law systems. See, eg, C Harding and M Rowell, "Protection of Property versus Protection of Commercial Transactions in French and English Law" (1977) 26 *International and Commercial Law Quarterly* 354.

property rights is disadvantaged in such circumstances.[1153] Nevertheless, "the reallocation of property in the (former) owner's [thing] to the recipient merely represents a wealth transfer which does not reduce society's net wealth."[1154]

13.72 Today, society attributes value to crypto-tokens and crypto-token systems.[1155] There is therefore an argument that the preservation of the functionality of those crypto-token systems (via the preservation and prioritisation of transaction sanctity) would provide a net benefit to society. This argument remains valid even if the security of the property rights of individuals that willingly participate in those crypto-token systems is reduced.

Alignment with the position under the equitable defence of good faith purchaser for value without notice

13.73 As we note above, we consider that the equitable defence of good faith purchaser for value without notice applies to crypto-tokens. In some circumstances, a perpetrator of a fraud or scam could obtain the superior legal title to a crypto-token (subject to the victim's equitable claim against the perpetrator). In that case, the victim's equitable interest would be extinguished against a subsequent good faith purchaser for value without notice. In contrast, a perpetrator of a "wrench attack"[1156] is unlikely to obtain the superior legal title to the crypto-token. This is because, in a theft or misappropriation of this nature, the legal title is unlikely to pass because the transfer was either not authorised or was made under severe duress. In such a case, in the absence of a broad innocent acquisition rule, a third party who acquires the crypto-token from the perpetrator may be vulnerable to a claim by the victim.[1157]

13.74 However, in the majority of cases, it will not be possible for a good faith purchaser for value without notice to determine that an attack has occurred in relation to a crypto-token, let alone the exact nature of the attack (and the complex legal consequences). From a fairness and consistency perspective, it seems odd that a purchaser could take free of certain claims but not others simply because of the specific nature of an attack that they (i) did not know about; and (ii) had no reasonable ability to investigate.

[1153] We discuss causes of action and remedies in more detail in Chapter 19.

[1154] D Fox, *Property Rights in Money* (2008) para 2.28 and D Fox, "Constructive Notice and Knowing Receipt" (1998) 57 *Cambridge Law Journal* 391.

[1155] Valued at approximately US$ 2 trillion according to IMF in October 2021: International Monetary Fund, "Global Financial Stability Report" (October 2021): https://www.imf.org/en/Publications/GFSR/Issues/2021/10/12/global-financial-stability-report-october-2021. It is however well-known that such value fluctuates over time and that the above figure has reduced to approximately US$ 1 trillion at the time of publication of this consultation paper. In addition, different people have different views of the value the market should attribute to different crypto-tokens and crypto-token systems.

[1156] A wrench attack is where an attacker physically coerces a holder of crypto-tokens either to transfer those crypto-tokens or give up control of those crypto-tokens (for example by giving over their private key). It is called a wrench attack because a wrench might be a suitable object with which physically to coerce someone (as immortalised by the famous XKCD comic at https://xkcd.com/538/). Such attacks are also sometimes referred to as "rubber hose cryptanalysis", where the chosen object is instead a rubber hose (see https://en.wikipedia.org/wiki/Rubber-hose_cryptanalysis).

[1157] We discuss this in more detail in Chapter 19.

13.75 We understand that frauds, scams, and social-engineering attacks in which the victim willingly transfers, or shares their ability to control, their crypto-token(s) are far more prevalent than wrench-attacks or hacks.[1158] In practice, therefore, in many situations, innocent acquirers will already be able to benefit from the equitable defence of good faith purchaser for value without notice. On that basis, we consider that an explicit innocent acquisition rule at law in respect of crypto-tokens would only effect a modest practical extension of the current law in this respect.[1159] It would, nonetheless, increase consistency and fairness of the application of the *nemo dat* principle and its exceptions to the crypto-token markets.[1160]

Consistency with international legal developments

13.76 An explicit innocent acquisition rule under the law of England and Wales would also be consistent with equivalent international developments. In particular, both the Uniform Law Commission's Uniform Commercial Code and Emerging Technologies Committee (the "ULC Committee") and the UNIDROIT Digital Assets and Private Law Working Group (the "UNIDROIT Working Group") recommend the introduction of an explicit innocent acquisition rule in the context of crypto-tokens.

13.77 The ULC Committee suggests this in its draft amendments to the Uniform Commercial Code.[1161] The draft Article 12 of the Uniform Commercial Code includes a definition of a "qualifying purchaser". In its guidance notes, the ULC Committee explains the rationale for the concept of a "qualifying purchaser".[1162] The ULC Committee also explains that the effect of the rule is to create a legal position in a transferee that is similar to the position of a holder in due course of a negotiable instrument:[1163]

> The ability to take a [controllable electronic record][1164] free of third-party property claims appears to be necessary for a controllable electronic record to have commercial utility. As is the case with Articles 2, 3, 7, and 9, Article 12 would facilitate commerce by affording to certain good-faith purchasers for value greater rights than their transferors had or had power to transfer. Draft Article 12 refers to

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1158 See eg Crystal Blockchain, "Crypto & DeFi Hacks & Scams Report" (2021) p 7: https://crystalblockchain.com/security-breaches-and-fraud-involving-crypto/.

1159 To the extent that the special defence does not already apply by analogy with the special defence in the context of money or negotiable instruments.

1160 We also note that, to the extent that market participants operate on the basis of the analysis in the UKJT Statement, this proposal actually represents an amelioration of the existing law — only in certain circumstances will a good faith purchaser for value without notice "take free" of existing (legal and equitable) interests.

1161 See https://www.uniformlaws.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=67fe571b-e8ad-caf8-4530-d8b59bdca805.

1162 Uniform Law Commission, *Draft - Uniform Commercial Code and Emerging Technologies – May 16-18 Meeting* p 146: https://www.uniformlaws.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=fa5c6c1b-c612-c453-b39d-8b4e3e8496f3.

1163 Above p 147.

1164 As we note above, the Uniform Law Committee refers to "controllable electronic records", as a sub-set of some digital assets. This definition is similar to our concept of a "crypto-token", albeit it is defined in a different way.

these purchasers as qualifying purchasers. Qualifying purchasers are purchasers that obtain control of a controllable electronic record for value, in good faith, and without notice of any claim of a property interest in the controllable electronic record. Like a holder in due course of a negotiable instrument, a qualifying purchaser of a controllable electronic record takes the controllable electronic record free of property claims.

13.78 The UNIDROIT Working Group takes a similar approach. The draft principles include a specific innocent acquisition rule at Principle 9: Innocent Acquirer Rule.[1165] Much like the proposed Article 12 of the Uniform Commercial Code, Principle 9 places a transferee of a crypto-token in a similar legal position to a holder in due course of a negotiable instrument. The UNIDROIT Working Group describes the position as follows:[1166]

> The rights conferred on [innocent acquirers] in accordance with subparagraphs (a) and (b) of paragraph (4) [of Principle 9] mean that [digital assets][1167] will have attributes similar to those of negotiability under rules applicable in some jurisdictions to negotiable instruments, negotiable documents of title, and negotiable certificated securities.
>
> Subparagraph (d) of paragraph (4) [of Principle 9] is intended to make clear that, for example, even if an acquirer receives control of a digital asset by a change in control made by a thief or a hacker, the acquirer may qualify as an innocent acquirer.

13.79 Both the ULC Committee and the UNIDROIT Working Group suggest an explicit innocent acquisition rule for crypto-tokens. The purpose of both rules is to reproduce characteristics of negotiability in crypto-tokens.

13.80 Given that many transfers of crypto-tokens are made between participants internationally, we consider that it is important for the law of England and Wales to remain as consistent as possible with international developments.[1168] Therefore, to the extent that it does not already do so, we think that the special defence of good faith purchaser for value without notice should also apply to a transfer of a crypto-token by a transfer operation that effects a state change.

Fungible versus non-fungible crypto-tokens

13.81 There is an argument that, in the context of the *nemo dat* principle, the "fungibility" (or "non-fungibility", as applicable) of a crypto-token should determine whether or not the

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1165 See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 23: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

1166 Above p 24.

1167 The UNIDROIT Working Group uses the term digital assets to mean "an electronic record which is capable of being subject to control (as the term control is used and defined in the Principles). See UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* p 7: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf.

1168 Provided those developments are consistent with the fundamental principles of the law of England and Wales.

special defence of good faith purchaser for value applies. This argument is most forceful in the context of some non-fungible tokens ("NFTs"), which are "intended to reflect the 'ownership of property'" and are sometimes expressed as being used to track "ownership of a unique thing".[1169] This argument relies on at least two propositions: (i) that the primary characteristic of money and of negotiable instruments that justifies the *nemo dat* exception is fungibility; and (ii) that different technical implementations of crypto-tokens deserve fundamentally different treatment at law.

13.82 As we argue in Chapter 15 at paragraph 15.13 fungibility is not an absolute concept.[1170] Fungibility instead depends on what different parties are willing to accept as mutually interchangeable. While we recognise that money is treated as fungible by market participants, there is an argument that this treatment is, in part, because of the legal rules of derivative title transfer that apply to money. On the other hand, it is not true to say that negotiable instruments are "fungible" in any real sense — they often record specific obligations. Nevertheless, the law recognises and prioritises transaction security in respect of both money and negotiable instruments.

13.83 We do not think it is helpful for the law to distinguish between technical implementations of crypto-tokens for the purposes of an innocent acquisition rule at law. First, buyers may or may not be aware of the exact technical implementation or token standard underlying a particular crypto-token. Second, creating a legal distinction between technical implementations or token standards would introduce uncertainty and create the opportunity for legal structuring arbitrage in the crypto-token markets, which we consider would be detrimental to the efficient operation of the crypto-token market. Third, neither the ULC Committee nor the UNIDROIT Working Group draw distinctions between technical implementations or token standards in their innocent acquisition rule recommendations.

Our proposal (and a caveat)

13.84 We provisionally propose that the special defence of good faith purchaser for value without notice that applies to negotiable instruments and money should also apply to transfers of all crypto-tokens (whether "fungible" or "non-fungible").

13.85 However, there is an important caveat to this proposal. This proposal only applies to the crypto-token itself. The consequences of derivative transfers of title to any linked things will depend on, among other things, the nature of the link, the applicable law, and the intention of the parties.

13.86 For example, under our suggested reform, an innocent acquirer of a crypto-token would acquire the crypto-token itself free of any conflicting claims. However, the same would not necessarily be true of any things that were linked to that crypto-token. For example, the crypto-token might contain an internal dataset and/or be linked to an external dataset stored elsewhere. Those datasets might be subject to protection under intellectual property law (for example, copyright law). Alternatively, those datasets might be subject to a licence agreement. Alternatively, the holding of the

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[1169] A Antonopoulos and G Wood, *Mastering Ethereum* (2018) p 227.

[1170] See also K Low, "The Emperor's New Art: Cryptomania, Art & Property" (2021) p 11.

crypto-token might be expressed as giving rise to external legal rights in relation to something else such as share or debt securities, or a tangible thing.

13.87 In the case of a transfer of a crypto-token to an innocent acquirer, the innocent acquirer would take the crypto-token itself free of any conflicting claims. But whether any external legal rights of the (former) holder were preserved notwithstanding the transfer to an innocent acquirer would depend on how those rights were structured.

13.88 In other words, our proposed innocent acquisition rule would only apply to crypto-tokens (the technical implementation) but not to cryptoassets as a whole (being the combination of a crypto-token and externally linked rights or things).

13.89 We accept that this reduces the degree of certainty that an innocent acquisition rule can provide to market participants. We also accept that the rule does not eliminate the risk of a "desynchronisation" of a crypto-token with the rights to which it is linked. However, the starting point is that market participants ought to be able to structure their affairs as they choose, in as flexible a way as possible. The innocent acquisition rule still allows market participants to create links between a crypto-token and external rights or things to a crypto-token system, and to specify whether those rights or things travel with the crypto-token.[1171] If, however, market participants want to avoid the application of an innocent acquisition rule to linked external rights or things to a crypto-token system, they can structure their products to reflect this intention.

Consultation Question 21.

13.90 We provisionally conclude that the rules of derivative transfer of title apply to crypto-tokens, notwithstanding that a transfer of a crypto-token by a transfer operation that effects a state change involves the creation of a new, causally-related thing. Do you agree?

Consultation Question 22.

13.91 We provisionally propose that:

(1) A special defence of good faith purchaser for value without notice (an innocent acquisition rule) should apply to a transfer of a crypto-token by a transfer operation that effects a state change. Do you agree?

(2) An innocent acquisition rule should apply to both "fungible" and "non-fungible" technical implementations of crypto-tokens. Do you agree?

(3) An innocent acquisition rule cannot and should not apply automatically to things that are linked to that crypto-token. Do you agree?

[1171] Subject to any restrictions of existing law such as regulatory or formalities requirements.

The need for legislation

13.92 It is possible that the common law could develop an innocent acquisition rule in respect of crypto-tokens by way of analogy with the existing special defence of good faith purchaser for value without notice that applies in respect of money and negotiable instruments.

13.93 However, in the absence of such a development we consider that market participants would benefit from a statutory provision which explicitly recognises an innocent acquisition rule in respect of transfers of crypto-tokens by a transfer operation that effects a state change. This is the approach recommended by both the ULC Committee and the UNIDROIT Working Group.

Consultation Question 23.

13.94 We provisionally propose that an innocent acquisition rule in respect of transfers of crypto-tokens by a transfer operation that effects a state change should be implemented by way of legislation, as opposed to common law development. Do you agree?

THE ROLE OF CONTROL

13.95 We consider that the concept of control plays an important (although not determinative) role in the overall analysis as to the legal effect of a transfer of a crypto-token.

13.96 First, as we discuss in Chapter 12, imposing or creating technical encumbrances over a crypto-token within a crypto-token system makes it possible for a person (or smart contract) to have a factual relationship of control with a crypto-token.[1172] It is typically also possible for that person (or smart contract) to divest themselves of the factual relationship of control with the crypto-token.[1173] In general, this will be effected by the technical completion of a transfer operation in accordance with the protocol rules of the relevant crypto-token system. So, in typical cases, a transfer operation that effects a state change will result in a change of control and in many cases, control will rely on or be determined by the state of the distributed ledger or structured record.

13.97 Second, following the transfer of a crypto-token by a transfer operation that effects a state change, new technical encumbrances and conditions regulate how the transferee can control that crypto-token. Absent any other indication, those technical encumbrances and conditions, together with the state of the distributed ledger or structured record, will provide rebuttable evidence as to the (superior) legal title holder

[1172] We discuss in detail in Chapter 10 and Appendix 3 how these factual concepts allow a crypto-token to satisfy our criterion of rivalrousness.

[1173] We discuss in detail in Chapter 11 why we think it is appropriate for the law of England and Wales to develop a factual concept of control that can be applied to a data object, including a crypto-token.

of the crypto-token.[1174] This is the intangible, crypto-token–specific analogue to the familiar common law presumption that factual possession is evidence of (superior) legal title.[1175]

13.98 This evidential presumption is already familiar in the context of tangible things. The common law starting point is the presumption that possession of a tangible thing is evidence of (the superior) legal title to that thing.[1176] The main effect of this presumption is to allocate the burden of proof in a dispute over legal title. A person who seeks to challenge a current possessor's legal title to an object of property bears the burden of proving their superior legal title to it.[1177]

13.99 We argue above that the rules of derivative transfer of title can be applied to transfers of crypto-tokens. If this is correct, control will be an important concept for situations in which (superior) legal title to a crypto-token is separated from what is recorded within the state of the distributed ledger or structured record.

13.100 Third, control is an important concept in many different legal and technical arrangements involving crypto-tokens. In particular, it will be an important element of structuring custody and collateral arrangements (which may or may not involve a factual transfer of a crypto-token). It is also likely to be important for the purposes of applying rules relating to competing interests, particularly in the context of disputes over title.

Competing interests

13.101 The technical encumbrances and conditions within a crypto-token system regulate how a particular crypto-token can be controlled. Together with the state of the distributed ledger or structured record within a crypto-token system, this will provide rebuttable evidence as to the (superior) legal title of the holder of the crypto-token.

13.102 However, this evidence can be rebutted in certain contexts. For example.

(1) A crypto-token associated with a particular address or controlled by a particular person may be held pursuant to some type of custody or collateral arrangement. For more detail on the legal consequences of these types of arrangement, see Chapter 16 and Chapter 18 respectively.

(2) The person with factual control over a crypto-token may have obtained that control without obtaining (superior) legal title to the crypto-token (for example, through a hack or a "wrench attack"). For more detail on the legal

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1174 We consider how custody arrangements and custody-like technical arrangements impact the concept of control further in Chapter 16.

1175 In Chapter 16, we discuss how a person could retain an equitable interest in a crypto-token in the context of custody arrangements.

1176 D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.50. See also *The Winkfield* [1902] P 42, 60 (Lord Collins MR); F Pollock, R Wright, *An Essay on Possession in the Common Law* (1888) pp 22 to 25; L Rostill, Relativity of Title and Deemed Ownership in English Personal Property Law (2015) *Oxford Journal of Legal Studies* 31.

1177 D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.50.

consequences of such an attack, see Chapter 19 and, in particular, paragraph 19.75.

13.103 The (superior) legal title to a crypto-token can therefore be located separately from both: (i) the recorded state of the distributed ledger or structured record; and (ii) a controller of the crypto-token.

13.104 In the context of tangible things, the law of England and Wales has a system of relative title.[1178] This means that the law recognises that different persons can, at the same time, have different degrees of title to the same object,[1179] and that the law has rules to rank these concurrent titles.[1180] In theory, all possible interests in an object could be ranked but, in practice, when disputes are litigated, the court will generally only concern itself with which of the two parties before it has the better title.[1181] We think that it is possible to apply similar concepts of relativity of title to crypto-tokens.

Factual control in the contexts of disputes over relativity and/or priority of competing interests

13.105 It is sometimes suggested that, since the exercise of control to effect a state change within a crypto-token system operates in a binary (all or nothing) way, it will always be possible to identify a single person who has control over a particular address.[1182] However, the factual situation is not always as straightforward as this.

13.106 Below, we discuss two examples of where the precise nature of the factual control in question could impact upon legal questions relating to relativity and/or priority of competing interests.

Multi-signature arrangements

13.107 It is common for a person to apply certain technical encumbrances and conditions (broadly referred to as "multi-signature arrangements") within a crypto-token system to regulate how a particular crypto-token can be controlled. In a multi-signature arrangement, the associated spending conditions or technical encumbrances generally require a certain combination or number of signatures (or fragments thereof) to validly compose a transfer operation that effects a state change and/or some other

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[1178] We note that the authors of *The Law of Personal Property* suggest that to conceive of a sort of relative title to intangible rights is "a concept which is alien, illogical and contrary to authority": see M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 15 to 127. On this basis, we consider that the more fruitful analogies are between data objects and tangible objects of property rights. It is of course possible to have priority disputes in relation to intangible things.

[1179] See eg *Gordon v Harper* (1796) 7 TR 9, 101 ER 828. In Professor Sheehan's words, there can be "several co-existent titles to property": D Sheehan, *The Principles of Personal Property Law* (2nd ed 2017) p 15.

[1180] See eg W Swadling, "Unjust Delivery" in A Burrows & A Rodger, *Mapping the law: Essays in Memory of Peter Birks* (2006) p 281.

[1181] See eg *Ocean Estates Ltd v Pinder* [1969] 2 AC 19, 25, by Lord Diplock; *Waverley Borough Council v Fletcher* [1996] QB 334, 345, by Auld LJ. See also S Douglas, *Liability for Wrongful Interferences with Chattels* (2011) p 24; M Crawford, *An Expressive Theory of Possession* (2020) p 55. Although see also s 8 (1) Torts (Interference with Goods) Act 1977, under which a defendant can join a named third party believed to have better title than the claimant: the *jus tertii* [right of a third party] defence.

[1182] And, by extension, the associated tokens. On this assumption, that person would be presumed to have the (superior) legal title to the associated crypto-tokens.

type of operation in respect of the crypto-token.[1183] In such a case, no single signature holder has a sufficient level of positive control over the crypto-token to be in control individually, since none can unilaterally effect a factual transfer of the crypto-token within the crypto-token system. However, each signature holder would be able to prevent a factual transfer of the crypto-token, by refusing to contribute their (fragment of a) signature. If three out of three signatures were required by the associated spending conditions or technical encumbrances, and all three private keys were combined, control could be exercised by the persons in the multi-signature arrangement acting jointly.

13.108 We do not think this is problematic, as comparable factual situations can arise in respect of tangible objects. In *Dublin City Distillery v Doherty*, which involved whisky stored in a warehouse, Lord Parker described the situation as follows:[1184]

> The warehouse was secured by means of two locks. The company had the key of one, and the officer in charge had the key of the other. Neither could obtain access to the warehouse without the assistance of the other. The officer in charge kept a book containing particulars of the spirits in the warehouse. If so requested by the company as to any parcel, he transferred it in his book to the name of the company's assignee, and after so doing recognized the assignee as sole proprietor of the parcel so transferred, and did not allow the parcel to be dealt with otherwise than by the order of such assignee. Until transfer he recognized no title but that of the company. Under these circumstances it is, I think, difficult to hold that the possession of any spirits after being placed in the warehouse remained solely in the company. It would rather appear that such possession was thereafter at most the joint possession of the company and the officer in charge, the spirits being held on account of the company or of its transferee in the books of the officer in charge.

13.109 The situation is more complicated if the multi-signature arrangement is a "two of three" type arrangement, where a combination of any two of the three (fragments of) signatures is necessary to effect a transfer of the crypto-token. Here, no one of the three can effect a factual transfer alone, but also none of the three is able to prevent a factual transfer (for example, if the other two agree to use their signatures). Such a situation is likely in practice to be regulated by contract, but the property law questions of who has what legal interests in the object (and whether anyone is in control of it) remain relevant, particularly in cases involving wrongdoing or disputes. In those scenarios, the concept of relativity of title is likely to be important to help determine which (if any) of the signatories has the best interest in the object of property rights.

Multiple persons not acting together

13.110 Additionally, although control can be consensually shared or "joint", this does not accommodate situations in which multiple persons who are not acting together or in agreement with each other have the same level of control over an object. In the context of tangible objects, this could arise where multiple persons have knowledge of a code to access an object in a vault or copies of a key giving access to a warehouse

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[1183] Multi-signature arrangements are also referred to as M-of-N arrangements, with M being the required number of signatures or keys to authenticate an operation and N being the total number of signatures or keys involved in the arrangement.

[1184] [1914] AC 823, 858.

storing goods. For our purposes, it could arise where multiple persons have knowledge of or the ability to recreate the requirements of the spending conditions or technical encumbrances associated with a particular crypto-token, giving them factual control over that crypto-token. That is, for example, where multiple persons have knowledge of the private key. In those circumstances, the factual relationship of control with a crypto-token might need to be combined with other factual evidence (such as at what point in time the factual relationship of control arose, and why) to help answer legal questions as to title and/or priority.

How can disputes be resolved?

13.111 Factual control will therefore be an important constituent part of the legal analysis in the context of title and/or priority disputes. For tangible things, there are existing common law rules to assist with the legal analysis as to title or priority where disputes arise between multiple persons that have factual possession of an object. We expect that over time, similar rules will be developed in respect of control that are more specific to the technical means by which such factual circumstances can arise within crypto-token systems or with respect to crypto-tokens. For example, in his 1961 essay, "Possession", Professor Harris identified nine factors which the courts have considered in the context of identifying possession.[1185] Many of these could be extrapolated to the context of control as a technical matter within crypto-token systems. However, given the huge range of potential factual scenarios, we do not think that this could be set out in statute in any helpful way.

Consultation Question 24.

13.112 We provisionally conclude that the rules of derivative transfer of title apply to crypto-tokens and that it is possible to separate (superior) legal title from the recorded state of the distributed ledger or structured record and/or factual control over a crypto-token. Do you agree?

13.113 We provisionally conclude that, over time, the common law is capable of developing rules to assist with the legal analysis as to title and/or priority where disputes arise between multiple persons that have factual control of a crypto-token, and that statutory reform would not be appropriate for this purpose. We consider that those rules will need to be specific to the technical means by which such factual circumstances can arise within crypto-token systems or with respect to crypto-tokens. Do you agree?

ANALOGIES WITH OTHER LEGAL METHODS OF TRANSFER

13.114 We argue above that it is most appropriate for the law to acknowledge the idiosyncrasies and nuances of the factual transfer of crypto-tokens by a transfer operation that effects a state change. We also consider that existing legal concepts,

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[1185] D R Harris, "The Concept of Possession in English Law" in A G Guest (ed), *Oxford Essays in Jurisprudence* (1961) p 70. The nine factors are set out in M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 11-009. We discuss these in some detail in Electronic Trade Documents (2022) Law Com No 405 para 7.90.

such as the rules on derivative transfers of title, and rules that help to resolve conflicts as to relativity and/or priority of competing interests can be applied to legal transfers of crypto-tokens. This will assist the law in drawing analogies with other existing and well-recognised methods of legal transfer. Those methods include a transfer by assignment, a transfer by novation, a transfer by sale, a transfer by deed or bill of sale, and a transfer by delivery, each of which we discuss below. However, we suggest that recognising the nuances of a factual transfer of crypto-tokens allows the law of England and Wales to develop crypto-token specific legal transfer rules without being fettered by the wholesale application of a single, imperfectly analogous transfer process.

Analogy with a transfer by way of assignment

13.115 As discussed at paragraph 12.6 above, we agree with the conclusion of the UKJT Statement that a transfer of a crypto-token by a transfer operation that effects a state change is:[1186]

> Not really analogous to the assignment of a legal right, where the same thing passes, unchanged, from one person to another.

13.116 Moreover, as we discuss in Chapter 10, it is not accurate to describe a (self-custodied) crypto-token as constituting a "right" against an obligor. The point is that there is no obligor against whom any right can be enforced — instead, crypto-tokens exist independently of persons and the legal system. And just as a crypto-token itself exists independently of persons and the legal system (as we discuss in Chapter 10), so does the mechanism of transfer by way of a transfer operation that effects a state change. The legal system can therefore *recognise* that the factual method of transfer by way of a transfer operation that effects a state change can have legal effects. But that transfer mechanism is not a legal construct in itself, in contrast to a transfer by way of assignment.[1187]

Analogy with a transfer by novation

13.117 We think that there is a closer analogy with a transfer by novation. Rights and obligations can be "transferred" by novation — for example, the mutual rights and obligations between a company and a shareholder. By novation, a shareholder transferor extinguishes the relationship between them and the company and that relationship is replaced by a new relationship between the transferee and the company.

13.118 This is clearly analogous to the factual consequences of a transfer operation that effects a state change. Such a transfer typically involves the replacing, modifying, destroying, cancelling, or eliminating of a pre-transfer crypto-token and the resulting

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[1186] UKJT Statement para 45.

[1187] See H Liu, "Title control and possession in the digital asset world" (2022) *Modern Studies in Property Law Conference 2022*: https://dx.doi.org/10.2139/ssrn.4079185 (forthcoming in Lloyd's Maritime and Commercial Law Quarterly). See also A Sanitt, "What sort of property is a cryptoasset?" (2021) 2 *Journal of International Banking and Financial Law* 83 (reproduced at https://www.nortonrosefulbright.com/en/knowledge/publications/26ade77a/what-sort-of-property-is-a-cryptoasset) at 84.

and corresponding causal creation of a new, modified, or causally-related crypto-token.[1188]

13.119 In addition, the new, modified, or causally-related crypto-token will have similar operational functionality to the pre-transfer crypto-token. In that way, the factual extinction and creation of the operational functionality of distinct data objects within a crypto-token system is closely analogous to the extinction and creation of mutual legal relationships on a novation. So there is an argument that similar legal consequences should apply.

13.120 However, in some cases, a transfer of a crypto-token by an operation that effects a state change will "consume" an old thing and "create" a new one: most notably for transfers within UTXO-based systems.[1189] In other cases, a transfer of a crypto-token by an operation that effects a state change will (at least) modify the crypto-token. But the new, modified, or causally-related crypto-token will contain an internal/external dataset that persists through the transaction. Depending on the way a thing or legal rights that are external to the crypto-token system have been linked to the particular crypto-token, the link might also persist through the transaction (see paragraph 12.52).

13.121 For those reasons, we consider that the legal consequences of a factual transfer of a crypto-token by an operation that effects a state change are distinct from the legal consequences of a transfer by novation. In particular, as we discuss at paragraph 13.19 above, we think that the existing legal rules of derivative transfer of title can apply to transfers of crypto-tokens, notwithstanding that the transfer results in a corresponding causal creation of a new, modified or causally-related crypto-token.

13.122 Nonetheless, we agree with the view of the CLLS that a transfer by novation is a helpful comparator. For shares or other registered securities, the process for the transfer requires the existence and use of an "instrument of transfer".[1190] In the case of a transfer of a crypto-token, the instrument of transfer is the factual transfer operation that effects a state change (as defined by the relevant protocol rules). The process for the transfer of shares or other registered securities also requires the updating of an instrument that constitutes or evidences title (for example, the share register). As we discuss from paragraph 13.57 above and in Chapter 14, in the context of crypto-token systems, this instrument is the crypto-token itself (as recorded by the state of the relevant distributed ledger or structured record).

13.123 We also anticipate that this close analogy with novation will be helpful, because it allows the law to draw analogies with existing financial market infrastructure (supported by the company and personal property law of England and Wales). In particular, it is likely to be helpful to be able to draw close analogies with the "transfer"

[1188] See para 12.6 above.

[1189] See discussion from para 12.4.

[1190] Meaning a certificate and proper instrument of transfer, where the shares or other securities are held in certificated form; or a "properly authenticated dematerialised instruction" attributable to the relevant "system-member", where the shares or other securities are held in uncertificated form in the CREST relevant system under the Uncertificated Securities Regulations 2001.

of, taking security over, or priority disputes relating to, shares or other registered securities. As the CLLS suggests:[1191]

> Market participants still properly view a transfer of such assets as a "transfer"; a mortgage or charge remains a well-accepted means of creating a security interest of such assets; and there is a clear, well-founded body of law that governs any priority or other title dispute as between competing claims to such assets — and in all cases, this is so notwithstanding the proper legal analysis for the transfer of such assets being founded on novation reasoning.

13.124 We think that it is sometimes helpful to draw analogies between existing financial market infrastructure and crypto-token systems, and the financial market infrastructure that has evolved around crypto-tokens. We think that our reasoning on the transfer of a crypto-token by a factual transfer operation that effects a state change is useful in this respect. Such a transfer is closely analogous to a transfer by novation. However, we think that the law should recognise and accept the idiosyncratic features of a transfer of a crypto-token by a factual transfer operation that effects a state change — namely that the transfer results in a corresponding causal creation of a new, modified, or causally-related crypto-token. We think that this recognition will become even more important as crypto-token financial market infrastructure (particularly decentralised finance ("DeFi"))[1192] continues to grow and innovate.

Analogy with an inter-bank payment instruction

13.125 We recognise that certain commentators have drawn analogies between transfers of crypto-tokens and inter-bank payments. For example, the UKJT Statement suggests that:[1193]

> There is a closer analogy with a bank payment where no property in the payer's funds passes to the payee; instead new property is created by credit to the payee's account.

13.126 Similarly, as we discuss above, the Ethereum White Paper draws an analogy with a bank payment (see paragraph 12.39). However, we agree with the observation of Professor Fox that this analogy is "limited".[1194] We think it is important to recognise the differences between the legal consequences of an inter-bank payment and the legal consequences of a factual transfer of a crypto-token. As Professor Fox observes:[1195]

[1191] City of London Law Society, "Digital assets: the limits of the concept of possession" (2021) p 4 n 6: https://www.citysolicitors.org.uk/storage/2021/08/Digital-Assets-The-Limits-of-the-Concept-of-Possession-13-08-21.pdf.

[1192] We discuss in more detail in Chapters 16, 17 and 18 how much of the crypto-token market uses intermediated structures which are similar to existing financial market infrastructure, but that DeFi structures are less reliant on intermediaries and generally operate in a distinct way to existing financial market infrastructure.

[1193] UKJT Statement para 45.

[1194] D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.19.

[1195] Above.

All that happens in the bank and cryptocurrency payments is that value flows through the consumption and creation of distinct entities, although with the difference that in the bank transaction the entities are debts, while in the cryptocurrency transaction they are unique items of digital information.

13.127 We think that it is important to recognise the distinction between the extinction and creation of legal rights and the factual extinction and creation (or modification) of a distinct crypto-token that can be the object of legal property rights. Indeed, the disintermediation of traditional communication and payment systems and the ability to control exclusive access to one's own data objects (that can persist through transactions in some modified form) is one of the core foundational tenets of decentralised crypto-token systems.[1196] We hope that recognising this distinction will help to cement the ability of persons to hold crypto-tokens in self-custody arrangements as a foundational touchstone of the law of England and Wales.

13.128 Nevertheless, we recognise that the crypto-token ecosystem also makes use of legal relationships that rely on some type of counterparty relationship, custodian, trustee, or some form of intermediation.[1197]

13.129 For example, a customer might have a relationship with a service provider (such as a crypto-token exchange) under which the crypto-token exchange holds crypto-tokens directly. In this situation, depending on the nature of the agreement between the customer and the crypto-token exchange, the nature of the legal relationship might look more like a traditional banker-customer relationship. Accordingly, payments made by a crypto-token exchange on the order of a customer might be much more akin to an inter-bank payment made by a bank on the order of its customer. We discuss these types of relationship in greater detail in Chapter 16.[1198]

Analogy with a transfer by deed or bill of sale

13.130 Above, we considered how legal methods of transfer applicable to things in action (that is, assignment and novation) could work, by analogy, in relation to crypto-tokens. We also think that it is worth considering analogies with existing legal methods of transfer for tangible things (things in possession). A transfer of legal title of tangible goods is effected under the law of England and Wales by three methods: a deed or bill of sale, by delivery, or by sale.[1199]

13.131 A deed or a bill of sale is an external, legal transfer mechanism (which requires certain formalities) that can be used to effect the transfer of legal title in a tangible good. In contrast, the factual ability to transfer a crypto-token by a transfer operation that effects a state change is an intrinsic feature of the crypto-token system in

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[1196] See, for example, Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008): https://nakamotoinstitute.org/bitcoin/.

[1197] Intermediation is, in general terms, a process for enabling the holding and transfer of title to securities through accounts provided and maintained by a person that holds the underlying securities, or an interest in or in relation to the underlying securities, for the benefit of the account-holder(s).

[1198] See also Chapter 10 para 10.67.

[1199] See H Liu, "Title control and possession in the digital asset world" (2022) *Modern Studies in Property Law Conference 2022*: https://dx.doi.org/10.2139/ssrn.4079185 (forthcoming in *Lloyd's Maritime and Commercial Law Quarterly*).

question. The purpose of this factual transfer mechanism is to ensure that state-change transfers can be effected by reference to the rules of the crypto-token system only. In that way, a transfer by a deed or bill of sale is not directly analogous to the legal transfer of a crypto-token by a factual transfer operation that effects a state change. The best analogy is that a deed or bill of sale is an instrument of transfer used to transfer title to a tangible good. In the case of a transfer of a crypto-token, the instrument of transfer is the factual transfer operation that effects a state change (as defined by the relevant protocol rules). However, as we discuss in more detail above, legal rules on the derivative transfer of title will still apply to such a factual operation.[1200]

13.132 Moreover, we think it would be unhelpful if a transfer of a crypto-token by a deed or bill of sale could take effect as a legal transfer of a crypto-token without a corresponding factual transfer operation that effects a state change. We do not think it would be useful to separate the instrument of legal transfer from the crypto-token or the crypto-token systems themselves.

Analogy with a transfer by sale

13.133 Transfers of title to tangible goods can also be made by a contract for sale (or by a contract for barter or exchange). It is possible in the context of sales of goods and contracts of barter or exchange for parties to agree the method and time at which title to goods is transferred. Specifically, section 17(1) of the Sale of Goods Act 1979 provides that:

> Where there is a contract for the sale of specific or ascertained goods the property in them is transferred to the buyer at such time as the parties to the contract intend it to be transferred.

13.134 So it is possible for legal title to a tangible good to transfer at the time at which the parties to the contract agree, without the need for delivery of the tangible goods.[1201] As we discuss below, we do not think that it is appropriate for the legal transfer of crypto-tokens to operate in the same way.

Crypto-tokens as "goods"?

13.135 At this point it is appropriate to consider briefly the question as to whether crypto-tokens are analogous to "goods", as currently defined in the Sale of Goods Act 1979 and other related statutes.[1202]

13.136 We agree with the majority of responses to our call for evidence that it is not legally correct or practically appropriate to treat crypto-tokens as "goods" or as analogous to "goods" within the meaning of the Sale of Goods Act 1979.[1203] While we consider that crypto-tokens are capable of being things that can attract property rights, this is not enough to bring them within the more specialised understanding of a "personal

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[1200] See also our consideration of novation where we draw the same analogy.

[1201] See ss 17 and 18 and rule 1 of the Sale of Goods Act 1979.

[1202] Including the Supply of Goods and Services Act 1982 and the Consumer Rights Act 2015. We asked this question at para 2.49 of our call for evidence.

[1203] Or the Supply of Goods and Services Act 1982.

chattel" in the Sale of Goods Act 1979. The same is true of the specialised concept of "tangible movables" within the Consumer Rights Act 2015.

13.137 Even if it were possible for crypto-tokens to fall within the definitions used by the Sale of Goods Act 1979, the Supply of Goods and Services Act 1982 and the Consumer Rights Act 2015, we agree with the view of the Financial Markets Law Committee that whether crypto-tokens ought to be treated as "goods" for these purposes is:[1204]

> Primarily [an issue] of consumer policy, rather than legal classification, and [that any uncertainty] may be dealt with accordingly by statutory amendment.

13.138 In support of that conclusion, we think there are two further arguments. The first is that, as discussed below, the rules for passing of legal title to tangible goods in the Sale of Goods Act 1979 make a poor fit with crypto-tokens. Professors Fox and Gullifer noted in their joint response to our call for evidence that the "[analogy is] so poor in fact that it confirms our view that the Sale of Goods Act 1979 can only have been intended to apply to tangible goods."

13.139 Second, we think that many of the implied terms provided in the Sale of Goods Act 1979 would be inappropriate in the context of the sale and transfer of a crypto-token. In particular, we agree with the Association for Financial Markets in Europe that rules that were developed to deal with tangible goods do not readily apply to crypto-tokens. In particular, we think that a number of specific provisions of the Sale of Goods Act 1979 might not be wholly applicable to crypto-tokens.[1205]

13.140 For those reasons, we do not think it is appropriate to treat crypto-tokens as analogous to "goods", as currently defined in the Sale of Goods Act 1979 and other related statutes.[1206]

Transfer of legal title to a crypto-token by a transfer operation that effects a state change

13.141 By contrast with the position in respect of goods, we consider that allowing a transfer of a crypto-token to take legal effect at the time the contract of sale is formed or when the parties choose for title to transfer would be inappropriate. That is, we do not consider that a simple contractual agreement to transfer title between two counterparties should be enough to actually effect a legal transfer of title. Instead, we consider that, for a legal transfer of a crypto-token to occur, there must be a transfer operation that effects a state change.[1207] The great advantage of making transactions with crypto-tokens by a factual transfer operation that effects a state change is the

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[1204] Financial Markets Law Committee, *Issues of Legal Uncertainty Arising in the Context of Virtual Currencies* (2016) http://fmlc.org/wp-content/uploads/2018/03/virtual_currencies_paper_-_edited_january_2017.pdf.

[1205] Those provisions include: (1) s 12(2)(b) (quiet possession); (2) s 14(2B)(b) (appearance and finish); (3) s 18 (deliverable state; weigh or measure); (4) ss 24 and 25 (seller and buyer in possession); (5) s 29 (delivery); (6) s 32 (delivery to a carrier); (7) s 35 (acceptance and delivery); (8) s 36 (delivery and rejection); and (9) s 44 (stoppage in transit).

[1206] Including the Supply of Goods and Services Act 1982 and the Consumer Rights Act 2015. We asked this question at question 5 (para 2.49) of our call for evidence. Respondents generally agreed.

[1207] As we discuss at para 13.22, we consider that a transfer operation that effects a state change is a necessary, but not sufficient, condition for a legal transfer of title to a crypto-token. Title may not necessarily transfer on the occurrence of the state change.

clarity that the distributed ledger or structured record provides. As we discuss above, any change in the state of the distributed ledger or structured record should generally correspond to a change in the legal title to the relevant crypto-token.[1208] In their joint response to our call for evidence, Professors Fox and Gullifer agreed. They suggested that:

> A regime that allowed legal title in the [crypto-token] to pass by contract alone would undermine the transparency and certainty of the [distributed] ledger [or structured record]. It would also open to the door to off-chain transfers of legal title.

13.142 We consider that this is already the position at law. We do not consider that market participants treat crypto-tokens as goods under the Sale of Goods Act 1979, or that market participants consider that it is possible for a transfer of a crypto-token to take legal effect at the time that a contract of sale is formed or when the parties choose for title to transfer. We consider that it would be helpful for the law to develop a coherent and principled position on this issue. Accordingly, we provisionally propose that the law should confirm that a state change is a necessary (but not sufficient) condition for a legal transfer of a crypto-token.[1209] We acknowledge however that there is an argument that the potentially wider condition of "a change of control" is a more suitable condition than a transfer operation that effects a state change, and ask a question on this point below.

13.143 As in respect of other issues on which we propose law reform, we think this could be achieved by either common law development or statute. However, we suggest that common law development is the most appropriate.

Consultation Question 25.

13.144 We provisionally conclude that it is not appropriate to treat crypto-tokens as analogous to "goods", as currently defined in the Sale of Goods Act 1979 and other related statutes, including the Supply of Goods and Services Act 1982 and the Consumer Rights Act 2015. Do you agree?

[1208] See para 13.7.

[1209] We acknowledge that there is also a timing point that relates to legal transfers of crypto-tokens, and discuss the concept of a transfer of a crypto-token becoming "probabilistically irreversible" in more detail at Chapter 12 n 1062. However, we do not at this stage make law reform proposals on this point.

Consultation Question 26.

13.145 We provisionally propose that the law should be clarified to confirm that a transfer operation that effects a state change is a necessary (but not sufficient) condition for a legal transfer of a crypto-token. We consider that this state change condition is more appropriate than the potentially wider condition of "a change of control". Do you agree? Do you agree that such a clarification would be best achieved by common law development rather than statutory reform?

13.146 Accordingly, we provisionally conclude that allowing title to a crypto-token to transfer at the time a contract of sale is formed, but where no corresponding state change has occurred, would be inappropriate. Do you agree?

Analogy with a transfer by delivery

13.147 Finally, we consider the analogy with a transfer of title by physical delivery of a tangible thing. A transfer of title of a tangible thing by delivery "generally involves an alteration in the spatial location of the relevant [tangible thing] with consequent changes in the parties' legal title to possession and ownership of it".[1210]

13.148 When considered in this way, a legal transfer by physical delivery of a tangible thing has some similarities with a legal transfer of a crypto-token by a factual transfer operation that effects a state change. Typically, a factual transfer operation that effects a state change will result in the imposition or creation of varying degrees of technical encumbrances in respect of the crypto-token (most commonly, the association of the crypto-token with the receiving public key address). Instead of the spatial location of a tangible thing being altered, the geometric location[1211] and/or technical encumbrances and associated spending conditions of the crypto-token are altered and recognised by the crypto-token system. The factual transfer by delivery of a tangible thing from the transferor to the transferee effects a change in the ability of the parties physically to control the tangible thing. The same is true of a transfer operation that effects a state change. Following such a factual transfer of a crypto-token, new technical encumbrances and associated spending conditions regulate how a controller can control a crypto-token.

13.149 Nevertheless, the analogy is not perfect. First, a controller's control over a crypto-token does not necessarily equate to possession as a legal conclusion — instead control as we describe it in this consultation paper is a factual relationship. Crypto-tokens are not tangible things in the normal sense[1212] and, except in the limited context of electronic trade documents that we discuss above,[1213] only tangible things are capable of being possessed at law. As such, our concept of control treats control

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[1210] D Fox, *Property Rights in Money* (2008) para 1.100. Note Professor Fox refers to transfers of corporeal money in the original quote.

[1211] See n 808 in Chapter 10 for more discussion on this point.

[1212] See para 10.62.

[1213] See para 11.53.

as an important (although not determinative) part of the overall analysis as to the legal effect of a transfer of a crypto-token. Because of the importance of the distributed ledger or structured record within a crypto-token system, and the multiple, technical ways in which control can be shared, the existence of factual control might have different legal consequences to the legal consequences of possession.[1214] Second, as we discuss in detail from paragraph 12.10 above, a transfer of a crypto-token by a factual transfer operation that effects a state change involves the acquisition of a new, causally-related thing by the transferee. While it is true that tangible goods might also change over time, a transfer by delivery does not in itself involve the acquisition of a new, causally-related thing by the transferee.

13.150 We therefore recognise that a transfer by physical delivery of a tangible thing is a helpful but not complete analogy with a factual transfer of a crypto-token by a transfer operation that effects a state change.

The limited utility of analogy

13.151 One of the principal purposes of this consultation paper is to suggest that recognising the idiosyncrasies of crypto-tokens and crypto-token systems will allow the law of England and Wales to develop crypto-token specific rules. It can do so without being fettered by the wholesale application of a single, imperfect analogy. We think this equally applies to analogies with existing legal transfer mechanisms of both intangible and tangible things.

13.152 While the above analogies are, to some extent, helpful as analytical or explanatory tools we consider that none are perfect. We also consider that any single analogy is likely to break down as it is stretched to encompass more complex crypto-tokens, crypto-token systems and implementations, such as Layer 2 implementations, and DeFi structures.

[1214] However, we discuss above from para 13.111, and in Chapter 11, that the courts will be able to develop legal rules based on the concept of control so that, for example, issues relating to relativity and/or priority of competing interests can be determined in different circumstances.

Chapter 14: Linking a crypto-token to something else

INTRODUCTION

14.1 In Chapter 10, we provisionally conclude that a crypto-token is capable of being an object of property rights. We describe a crypto-token as a particular instantiation of a data structure within an operating crypto-token system with certain functionality that allows it to satisfy the criteria for our proposed third category of personal property — data objects.

14.2 In this chapter we discuss the different ways in which a crypto-token might be linked to something else — normally a thing external to the crypto-token itself and/or the crypto-token system in which it is instantiated — and the potential legal consequences of such a link. There are multiple different ways to constitute a link between a crypto-token and something else and the examples of different links in this chapter are non-exhaustive. The strength of any such link is likely to depend on a number of factors, including the exact wording of any contractual terms or the approach of possible future legislative provisions relating to the link. We do not propose any law reform concerning linking at this stage.

EXOGENOUS VERSUS ENDOGENOUS

14.3 Many crypto-tokens are not linked to anything external to the crypto-token system in which they are instantiated. In such situations, the token itself constitutes the asset of interest or value. Within the system they represent only a quantity of a notional unit of account (such as bitcoin or ether) which is intrinsic or endogenous to its respective crypto-token system.[1215] For this reason, some commentators refer to these tokens as "endogenous" crypto-tokens.[1216]

14.4 In contrast, some crypto-tokens are used either to represent something external to the crypto-token system or are in some way linked to something external to the crypto-token system, or indeed another crypto-token. For example, a crypto-token might purport to link to an intangible thing (like an equity or debt security), or a legal right against an obligor (like a contractual debt) or to a tangible thing (like goods or land). Some commentators refer to these tokens as "exogenous" crypto-tokens,[1217] given

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[1215] For an in-depth consideration of this point in relation to bitcoin, see C Warmke, "Electronic Coins", *Cryptoeconomic Systems* (forthcoming): https://www.resistance.money/EC.pdf, who notes that "unspent transaction output" (used in the context of bitcoin) is often ambiguous between the chunk of code that signifies a quantity of unspent bitcoin and the signified quantity itself.

[1216] See for example M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-043; K Low, "Confronting Cryptomania: Can Equity Tame the Blockchain?" (2020) 14 *Journal of Equity* 240, 261; and H Liu, "Digital assets: the mystery of the 'link'" (2022) 3 *Journal of International Banking and Financial Law* 161.

[1217] See for example M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 8-043; K Low, "Confronting Cryptomania: Can Equity Tame the Blockchain?" (2020) 14 *Journal of*

their link to something external to the crypto-token system. We also note that some crypto-tokens can be linked to other crypto-tokens which may be instantiated within the same crypto-token system (for example, fractional ERC-20 tokens issued in connection with a locked NFT or a basket of other crypto-tokens).

14.5 We do not adopt the distinction between "endogenous" and "exogenous" in this consultation paper. This is for two reasons. First, our use of the term crypto-token clearly refers only to an instantiated data structure within a crypto-token system, and not any exogenous, linked thing, right, or asset.[1218] Second, we think that it is both technically and theoretically possible for what might otherwise be considered an "endogenous" crypto-token to be linked to something external to the crypto-token system.[1219] Indeed, this is exactly how Colored Coins works within the Bitcoin system. Colored Coins is a protocol that overlays information on small quantities of bitcoin.[1220] That metadata can then be used for an additional, ancillary purpose external to the Bitcoin system — for example, to represent an external thing.

14.6 So, in this consultation paper we draw a clear distinction between:

(1) the thing that is a crypto-token, which itself is capable of being an object of property rights; and

(2) another thing — normally external to the crypto-token system (such as a legal right or a tangible asset) — to which that crypto-token might be linked (or purport to be linked).

14.7 Nevertheless, crypto-tokens linked to something else are common in the market. In this chapter, we consider some of the many different ways in which a crypto-token might be linked to something else and the potential legal consequences of such a link.

INFORMATION LINKED TO A CRYPTO-TOKEN

14.8 Crypto-tokens will invariably contain a specific internal dataset. That internal dataset will be part of the crypto-token data structure itself, and so will be recorded within the crypto-token system in some way. Some of that internal dataset will describe the features or details of the crypto-token itself. For example, the information will specify:

(1) the type of the crypto-token (such as bitcoin, ether, solana, CryptoPunk, Bored Ape Yacht Club ("BAYC")); and

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Equity 240, 261; and H Liu, "Digital assets: the mystery of the 'link'" (2022) 3 *Journal of International Banking and Financial Law* 161.

[1218] For more detail on this point, see Chapter 10.

[1219] See also H Liu, "Digital assets: the mystery of the 'link'" (2022) 3 *Journal of International Banking and Financial Law* 161, 161, who argues that "the line between 'endogenous' and 'exogenous' cryptoassets can actually be quite unclear."

[1220] See A Antonopoulos, *Mastering Bitcoin* (2nd ed 2018) p 221 for more detail.

(2) other relevant details, such as unspent transaction output ("UTXO") values, to and from address, block height and might include references to external Uniform Resource Identifiers ("URIs").[1221]

14.9 However, there is a practical, technological limit to the amount of data that can be stored internally within a particular crypto-token or crypto-token system.[1222] Because of this practical limit, the crypto-token data structure itself might also include a link or reference to data/information which is stored or which exists externally to the crypto-token system (an external dataset).

14.10 Our description of a crypto-token recognises that the data structure of a crypto-token will include an internal dataset. As we discuss in Chapter 10, the data structure of a crypto-token is informational in nature, but it has operational or functional qualities that allow the crypto-token to be capable of attracting property rights.[1223] We also recognise that the data structure of a crypto-token can contain an additional internal dataset that does not give rise to any additional operational or functional qualities. We nevertheless consider that such internal dataset is capable of being a constituent element of the crypto-token in question, albeit the specific information it records remains informational only.

14.11 In addition, a crypto-token can contain a reference which links or points to an external dataset that exists outside the crypto-token system. In general, that link to the external dataset will be maintained after any operation performed in respect of the crypto-token (such as a transfer). That is, the link to the external data normally persists through transactions.[1224] For example, reference to an external URI contained within a crypto-token contract will, in general, be the same pre-and post-transfer of the crypto-token.

14.12 In high-level terms, a URI is information that points to the location of a file on storage somewhere (such as an image).[1225] The URI will have the capacity to generate or derive a particular instance of the stored external dataset in question. For example, any person can access the following publicly available IFPS[1226] HTTP Gateway URL[1227] and an instance of a picture of BAYC #1 will be generated on their graphical user interface:
https://gateway.pinata.cloud/ipfs/QmPbxeGcXhYQQNgsC6a36dDyYUcHgMLnGKnF8pVFmGsvqi

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[1221] A Uniform Resource Identifier ("URI") is a string of characters that uniquely identifies a name or a resource on the internet. A URI identifies a resource by name, location or both. See D Miessler, "The difference between a URL, URI and a URN" (2022): https://danielmiessler.com/study/difference-between-uri-url/.

[1222] See M Antonopoulos and G Wood, *Mastering Ethereum: Building Smart Contracts and DApps* (2021) p 317.

[1223] See Chapter 10.

[1224] We note that there are some crypto-tokens whose external dataset is designed explicitly to change on transfer.

[1225] J Moringiello and C Odinet, "The Property Law of Tokens" *Florida Law Review* (Forthcoming 2022) p 31: https://ssrn.com/abstract=3928901.

[1226] IFPS (InterPlanetary File System) is a protocol and peer-to-peer network for storing and sharing data in a distributed file system, see https://ipfs.io/.

[1227] An HTTP Gateway URL is simply a "gateway" link which helps services that do not automatically recognise URIs to locate and load the content over IPFS and serve it using HTTP.

14.13 We discuss how this type of external dataset can be linked to a crypto-token in more detail at paragraph 14.17 below.

14.14 We think that as crypto-token systems evolve, they are likely to use multiple, layered protocols such that the data availability function of crypto-token systems can be expanded.[1228] This means that much larger amounts of data or information will be able to be externally linked to a crypto-token or recorded internally within the crypto-token system.[1229] Simple examples would be information recording the detailed terms of long-form contracts or licensing rights, or information recording a very high resolution image or video. In the past, this was not possible because large amounts of information were not capable of being externally linked to a crypto-token or recorded internally within the crypto-token system. We also expect that both internal and external datasets will become more composable[1230] as the crypto-token market evolves. This will mean that different applications will be able to interface directly with different, distinct elements of the internal and external datasets.[1231]

14.15 However, while a particular internal dataset contained within the crypto-token data structure itself is capable of forming a constituent part of the thing that is a crypto-token, any legal rights in relation to that information are necessarily external to the crypto-token system. Similarly, a particular external dataset could be linked to a crypto-token. But again, any legal rights in relation to that information are necessarily external to the crypto-token system.

[1228] For example, it is expected that Layer 2 protocols will help to achieve scaling of crypto-token systems by disaggregating the three broad functions of crypto-token systems. Those three functions are:

(1) achieving consensus as to the state of the distributed ledger or structured record in a secure way (security);

(2) storage of data, including the data that constitutes a crypto-token (data availability); and

(3) the performance and execution of operations, including transactions, in respect of crypto-tokens (execution).

For a more detailed discussion on this point, see Liberosist, "Beyond L1 and L2: a new paradigm of blockchain construction" (2021): https://www.reddit.com/r/ethfinance/comments/oa4g0b/beyond_l1_and_l2_a_new_paradigm_of_blockchain; Polynya, "Rollups, data availability layers & modular blockchains: introductory meta post" (2021): https://polynya.medium.com/rollups-data-availability-layers-modular-blockchains-introductory-meta-post-5a1e7a60119d.

[1229] Here, we use crypto-token system in a broad sense to include the "external" data availability layer of a Layer 2 implementation. We briefly discuss how some of the concepts in this consultation paper might apply to different Layer 2 implementations in more detail in Appendix 5.

[1230] A platform is composable if its existing resources can be used as building blocks and programmed into higher order applications. See J Walden, "4 Eras of Blockchain Computing: Degrees of Composability" (2018): https://a16z.com/2018/12/16/4-eras-of-blockchain-computing-degrees-of-composability/.

[1231] Today, applications external to a crypto-token contract are generally able to interface with the composable elements of the crypto-token (eg, the transfer, ownerOf, balanceOf, elements of the ERC-721 non-fungible token ("NFT") token standard). This allows those applications to understand, for example, which address "owns" the particular NFT. In future, the datasets of crypto-tokens are likely to become more composable, such that an external application could also understand different distinct parts of that data. An example would be that an external application would then not only be able to understand which address "owns" a particular NFT, but also to understand the other data within that NFT (such as "rareness", "character traits", etc).

14.16 Therefore, the starting point when considering crypto-tokens is that the crypto-token can be an object of property rights in itself. The crypto-token will include an internal dataset as a constituent part of the crypto-token. The crypto-token could also be linked to an external dataset stored elsewhere. While the information itself can be recorded either internally or externally to the crypto-token, the information itself cannot be the object of property rights. By way of analogy, a piece of paper can be the object of property rights, but the information recorded on a piece of paper cannot.[1232]

DIFFERENT TYPES OF LINK

14.17 There are many ways in which the ability to record information internally within, or link information externally to, a crypto-token might be useful. We discuss the specific question of how information might be linked to a crypto-token in the context of "non-fungible tokens" ("NFTs") and intellectual property rights in Chapter 15.

14.18 As well as information, it is also possible to link a crypto-token to other things external to crypto-token system including an intangible thing (like an equity or debt security), a legal right against an obligor (like a contractual debt) or a tangible thing (like goods or land). We explore some of the ways in which such a link might be constituted, and the legal consequences of such links below.

A crypto-token used as part of a register or record

14.19 There are many different tools that a registrar could use to create a register or record. If Alice gives gifts to friends and family at Christmas, she might use a piece of paper to make a list of the gifts and the recipients of those gifts. The physical list, as a tangible piece of paper, would be an object of personal property rights. However, the recipients of the gifts as recorded in the list would have no property rights in relation to the paper list. The link between the list and the gifts recorded on it would be evidential only. It would be a tool for creating the record, enabling Alice to track which friends and family had received which gifts. Equally, Alice holding the paper list would not confer on Alice any legal rights over the gifts, as those legal rights would obviously be external to the piece of paper.

14.20 A crypto-token could be used in a similar way: merely as a record or register of a thing external to the crypto-token system. In this context, if the crypto-token satisfied our proposed criteria described in Chapter 5, it would be capable, in itself, of attracting property rights.

14.21 In their response to the call for evidence on digital assets, Linklaters LLP provided a practical example:

> A registrar could agree with users that it will keep a record or register of certain transactions (and maintain control over the record or register over and above the beneficiaries of the records) and yet it could use [crypto-tokens] as the basis, or a component, of that record or register. In this context, the [crypto-tokens] may…amount to property in the hands of the record keeper or registrar, but any person whose entitlement is being recorded by the registrar would have no claim

[1232] See *Boardman v Phipps* [1967] 2 AC 46 at 127 to128 and *Oxford v Moss* (1979) 68 Cr App R 183 at 186.

over the [crypto-tokens] themselves (as those [crypto-tokens] are used by the registrar in a principal capacity).

14.22 In this scenario, a registrar of a debt securities issuance (in its capacity as principal) could use a crypto-token system in discharge of its obligations as registrar (for example, as a replacement for an Excel spreadsheet).[1233] In that case, the crypto-tokens held by the registrar would be capable of attracting personal property rights — and the registrar would be the owner of those particular tokens. However, those crypto-tokens would be things over which the holders of the linked debt securities would have no personal property rights. In other words, the legal link between the crypto-token and the underlying debt securities would be evidential only. The link would simply be that the crypto-token was used to record or track something else happening that was external to the crypto-token system (here, who the holders of debt securities were). Holding or owning the particular crypto-tokens would confer no additional legal rights on a token holder in respect of the debt securities that were external to the system. The crypto-token would simply be a thing used as a tool for creating a record or register of debt security holders.

14.23 To illustrate this point further, Linklaters LLP drew an analogy with an abacus where the beads on an abacus were used as a record of transactions. While the abacus beads themselves would attract personal property rights, the beads would confer no legal rights in respect of the underlying transactions or legal rights that they recorded. The abacus beads used to record underlying transactions or legal rights might also be owned by somebody different from the parties to the underlying transactions or the persons able to enforce the legal rights in relation to those transactions.

14.24 Alternatively, a record or register could be set up such that the holder of the linked securities/assets themselves could hold directly the crypto-tokens used to record the holding of those securities/assets external to the crypto-token system. Again, even where a holder of the underlying securities/assets held the crypto-token used as a record, the holding of the crypto-token would confer no additional legal rights in respect of the securities/assets themselves. Of course, the crypto-token would attract personal property rights in the hands of the holder. However, the token would represent merely an informational record that denotes the tokenholder's entitlements to the external asset.[1234]

14.25 So, in the scenario where a crypto-token is used as a mere record, the link between the crypto-token and the thing external to the crypto-token system that it records is evidential only.[1235] The record or registration system will provide evidence of the legal state of affairs. The record-keeper might also be under a separate legal (for example, contractual) obligation to maintain an accurate record of the legal state of affairs. However, the crypto-token itself would confer on the holder no legal rights in respect of the thing external to the crypto-token system.

[1233] This example was contained in Linklaters LLP's response to our call for evidence.

[1234] See H Liu, "Digital assets: the mystery of the 'link'" (2022) 3 *Journal of International Banking and Financial Law* 161, 166.

[1235] See H Liu, "Digital assets: the mystery of the 'link'" (2022) 3 *Journal of International Banking and Financial Law* 161.

14.26 The crypto-tokens used in such a record-keeping system could in their own right satisfy the criteria of data objects described in Chapter 5 and fall within our broad description of a crypto-token in Chapter 10 and Appendix 4. However, where such crypto-tokens were used as a record-keeping device only (in the same way as an Excel spreadsheet, for example) there might be good policy arguments that such crypto-tokens ought to fall outside the scope of certain regulatory regimes.[1236]

A statutory register or record

14.27 Statutory registers are used to record title to, and interests in, various objects of property. For example, the registered proprietor of a piece of land in England and Wales is deemed to have been vested with the legal estate by registration.[1237] Consequently, a person registered as a proprietor as a result of fraud or mistake has a valid title and can rely on the provisions of the Land Registration Act 2002 as conclusive evidence of their interest.[1238]

14.28 It is possible that legislation could designate a particular crypto-token system or particular crypto-tokens as a register of title of certain specified things.

14.29 For example, a statute could provide that a particular crypto-token/crypto-token system which tracked the supply chain of wholesale diamonds was conclusive evidence of the legal title to those diamonds.[1239] There are however difficulties with such an approach, as Professor Gullifer QC noted:[1240]

> There probably couldn't actually be such a statute in reality, since the supply chain in diamonds is so international that no one country could legislate effectively, but it is quite a good illustration of where a digital system which already exists could be given legislative force so that registration became legal title.

14.30 Alternatively, a statute could permissively allow an existing paper or electronic register to be constituted by a crypto-token system.[1241] For example, the statute could provide that a share register of a company could be held using a crypto-token system and crypto-tokens. An example of a statute which has this effect is the Delaware Code, Corporations Law which allows a "stock ledger" to be held on a "distributed electronic

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1236 For example, HM Treasury's proposed definition of "qualifying cryptoassets", for the purposes of amending the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (SI 2005/1529) is only designed to encompass "cryptographically secured digital representation[s] of value or contractual rights which [are] fungible and transferable": HM Treasury, *Cryptoasset promotions: Consultation response* (2022) para 4.18: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1047232/Cryptoasset_Financial_Promotions_Response.pdf.

1237 See the Land Registration Act 2002, s 58.

1238 *Swift 1st v Chief Land Registrar* [2015] EWCA Civ 330, [2015] Ch 602; although they may be subject to a claim to have the register rectified against them.

1239 This example was given by Professor Gullifer QC in "The private law of digital assets: what is it and what should it be?", Gray's Inn Annual Birkenhead Lecture (15 November 2021): https://www.graysinn.org.uk/app/uploads/drupal-media/documents/education/The%20private%20law%20of%20digital%20assets%2017.11%20-%20Birkenhead%20Lecture.pdf.

1240 Above.

1241 Above.

network or database".[1242] Similarly, the Labuan International Business and Financial Centre, Malaysia is silent on the form that the register must take and companies have used crypto-tokens/crypto-token systems to constitute their registers.[1243]

14.31 In this way, legal title to the corporate shares referenced by the linked crypto-token would be evidenced by the state of the distributed ledger or structured record within the crypto-token system. This situation would be analogous to the legal status of a share register under the law of England and Wales, where the register provides *prima facie*[1244] evidence of the holder of legal title to the relevant shares,[1245] but not conclusive evidence.[1246]

14.32 A statutory register would, therefore, operate to strengthen the link between a crypto-token/crypto-token system and the thing it was used to record or represent. The statute would effectively convey on the crypto-token/crypto-token system "a status equal or similar to the primary record of entitlement to an asset constituted by entry on a register".[1247] The crypto-token/crypto-token system could then be used as a public instrument of which third parties could make enquiry to verify the title of the holder and place trust as to the integrity of the holder's title recorded on it.[1248]

14.33 In this way, the use of crypto-tokens/crypto-token systems as records or registers would be similar to the way in which registers or records are currently used for certain financial instruments such as shares, securities, and other registered intangible assets.[1249]

14.34 In the context of shares, securities, and other registered intangible assets, market participants take additional comfort as to the "strength" of the link between a register entry and the thing itself because of the ways in which transfers are controlled. As the

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[1242] Delaware Code, Corporations Law, s 224, Form of records: "Any records administered by or on behalf of the corporation in the regular course of its business, including its stock ledger, books of account, and minute books, may be kept on, or by means of, or be in the form of, any information storage device, method, or 1 or more electronic networks or databases (including 1 or more distributed electronic networks or databases), provided that the records so kept can be converted into clearly legible paper form within a reasonable time".

[1243] See H Liu, "Digital assets: the mystery of the 'link'" (2022) 3 *Journal of International Banking and Financial Law* 161, 169: "s 105 of the Labuan Companies Act 1990 does not prohibit companies from using the blockchain as a share register (it is silent on the technological form that the register must take)".

[1244] On a first impression – that is, the record will provide sufficient evidence of the location of legal title unless there is sufficient evidence to the contrary.

[1245] See Companies Act 2006, s 127; *J Sainsbury Plc v O'Connor (Inspector of Taxes)* [1991] 1 WLR 963 at 977.

[1246] The true holder of legal title is entitled to be entered on the register if the register is incorrect. See M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd 2021) para 27-022 and 34-038. See also Lord Cairns in *Reese River Silver Mining Co v Smith* (1869) LR 4 HL 64 at 80: "But it is perfectly clear, my Lords, that you cannot make the register absolutely conclusive. Many cases can be pointed out, without difficulty, in which the register is not conclusive."

[1247] City of London Law Society, "Digital assets: the limits of the concept of possession" (2021) p 10: https://www.citysolicitors.org.uk/storage/2021/08/Digital-Assets-The-Limits-of-the-Concept-of-Possession-13-08-21.pdf.

[1248] Above.

[1249] See, for example, Intermediated securities: who owns your shares? A Scoping Paper (2020) Law Com p 18 to 19, discussing the CREST system.

City of London Law Society (the "CLLS") suggested in their response to our call for evidence on digital assets: [1250]

> For such registered intangible assets, the instrument that constitutes or evidences title (the register) is different from the instruments that must be used to transfer that title (i.e. a certificate and proper instrument of transfer, where the shares or other securities are held in certificated form; or a "properly authenticated dematerialised instruction" attributable to the relevant "system-member", where the shares or other securities are held in uncertificated form in the CREST relevant system under the Uncertificated Securities Regulations 2001).

14.35 Market participants recognise that there are specific methods and instruments of transfer used to transfer legal title to shares, securities and other registered intangible assets. These methods and instruments have evolved through a combination of market practice, common law, and statute.[1251] The specificity of these methods and instruments of transfer give market participants additional comfort in relation to the "strength" of the link between a register entry and the thing itself. Market participants can take comfort that, in general, the register entry will only be updated if the proper methods and instruments of transfer are used.

14.36 Similarly, where a crypto-token/crypto-token system is used as a register or record, market participants should be able to discover how a transfer of any such crypto-token operates within the specific crypto-token system.[1252] Again, market participants can take comfort that, in general, the register or record will only be updated if the particular requirements for transfer within the crypto-token system are satisfied. These requirements for transfer are likely to be included within the crypto-token systems protocol rules, for example.

14.37 In addition, there could be further external or legal constraints on transfer. For example, a registrar might be contractually obliged not to initiate a transfer of a crypto-token used as a record within a crypto-token system until certain external requirements (such as evidential or procedural formalities) are complied with.

14.38 The requirement for additional formalities to effect the transfer of a thing external to the crypto-token system could affect the strength of the link between the crypto-token and the external thing in two ways. On the one hand, the link is weakened if a formal step, such as registration, is required to transfer the thing external to the crypto-token system. This would be the case with respect to external things such as shares, intellectual property rights or land. Without more, a transfer of the linked crypto-token will not effect a transfer of the external thing.[1253] In that circumstance, the transfer of the linked crypto-token would simply evidence an intention to transfer the external

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[1250] City of London Law Society, "Digital assets: the limits of the concept of possession" (2021) pp 3 to 4: https://www.citysolicitors.org.uk/storage/2021/08/Digital-Assets-The-Limits-of-the-Concept-of-Possession-13-08-21.pdf.

[1251] Above.

[1252] We note that this will depend on the design of the crypto-token system itself and, in particular, whether records of transactions are publicly accessible.

[1253] Although the transfer might be effective in equity.

thing. This could give rise to a personal claim against the transferor for failure to effect the real world registration or formality requirement.

14.39 On the other hand, formalities or registration requirements could be built into the relevant record keeping or registration systems. The systems could be designed such that it was not possible to transfer the linked crypto-token without first having completed the formality or transfer requirement. For example, a land registrar could decide to use a crypto-token/crypto-token system to record title to land. If it did so, the system could be designed such that a transfer of a crypto-token linked to a piece of land could only be effected by including proof of the relevant formalities.[1254] The requirement for proof could be structured in multiple different ways. For example, the relevant registrar could be included as a signatory in a multi-signature arrangement and only sign a transaction to transfer the linked crypto-token once it had checked and approved the required formalities for a transfer of land. Alternatively, a separate "registration and formalities" token could be issued by the relevant registrar. The system could be constructed in such a way that a transfer of the crypto-token linked to a specific piece of land could only be effected by including proof of holding of the "registration and formalities" token. In this way, the link between the crypto-token and the thing external to the crypto-token system could be strengthened because a transfer of the crypto-token would also provide good evidence that the related formalities had been complied with.

14.40 How well these crypto-token system-level and external (if any) methods of transfer operate together will determine the amount of additional comfort that market participants will take in relation to the "strength" of the link between a register entry and the thing itself.

14.41 In other words, it is perfectly possible that crypto-tokens/crypto-token systems could be used as a register or record for rights to which they are linked. Such systems would operate in much the same way as registers or records for shares, securities, and other registered intangible assets. With respect to shares, securities, and other registered intangible assets, market participants recognise that entries in the relevant register generally provide only *prima facie* evidence of title. But market participants also recognise that the register entries will only be updated when specific methods and instruments of transfer are complied with. So, in respect of registered shares, for example, market practice, common law, and statute operate together to build the "strength" of the link between the entry in the share register and the share itself.[1255] The combination of these things works to create a link so strong that legal title to corporate shares is sometimes described as "constituted" or "vested" in the registered

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[1254] We note that this is not currently a proposal, although the Land Registry has built a prototype digital register to explore "how the next evolution of the Land Register could deliver significant benefits for data users", see: https://hmlandregistry.blog.gov.uk/tag/digital-street/.

[1255] A share means a share in a company's share capital: Companies Act 2006, s 540. A share in a company is personal property: Companies Act 2006, s 541. It consists of the interest of its holder in the company measured by a sum of money and is made up of various rights conferred by the contract contained in the articles of association: D Prentice and M Arden (eds), *Buckley on the Companies Acts* (Issue 42, 2021) p 540 to 541.

holder (instead of evidenced by the entry on the register).[1256] Again, it is possible that a similar effect could be achieved with a register or record that was based on a crypto-token/crypto-token system, instead of some other record-keeping method.

14.42 In this respect, Hin Liu has suggested that the link between a crypto-token and a linked thing can be strengthened in two ways by imposing certain restrictions on the transfer.[1257]

(1) First, in a "positive" way, by ensuring that the transfer of a crypto-token also effects a corresponding transfer of the linked thing.

(2) Second, in a "negative" way, by ensuring that the legal rights to the thing external to the crypto-token system cannot be transferred without (or in isolation from) a corresponding transfer of the crypto-token.

14.43 We consider that crypto-tokens/crypto-token systems can be used as a register or record for things external to the crypto-token system. The strength of the link between the crypto-token/crypto-token system and the external thing will depend on the evolution of market practice, common law, and statute, as well as the particular contractual arrangements in respect of that particular register or record. But there is no reason why such a link cannot be as strong[1258] as it is with record keeping or registration systems that do not rely on crypto-tokens/crypto-token systems.

A statutory link

14.44 In the examples above, we discussed the possibility that a statute could permit a crypto-token/crypto-token system to be used as a record or register. We discussed how the combination of such a statute, common law, and market practice could operate to strengthen the link between a crypto-token/crypto-token system and a linked thing. In that situation, the crypto-token/crypto-token system would provide strong, *prima facie* evidence as to the holder of legal title. Legal certainty would not necessarily be undermined simply because the register or record entry could not be treated as absolutely conclusive.

14.45 It is also possible that legislation could provide a specific, statutory legal link between a crypto-token and a thing external to the crypto-token system. Again, the strength of the link would depend on the wording of the legislation, as well as the way in which such legislation was applied within that specific jurisdiction.

14.46 An example of where a statute explicitly provides for a legal link between a crypto-token and a thing external to the crypto-token system is Liechtenstein's Token and TT

[1256] See, for example, Lord Justice Nourse in *J Sainsbury Plc v O'Connor (Inspector of Taxes)* [1991] 1 WLR 963 at 977: "There is no difficulty in ascertaining the legal ownership of shares, which is invariably vested in the registered holder." As we discuss above, we consider that the correct position is that the register is not conclusive evidence of title.

[1257] See H Liu, "Digital assets: the mystery of the 'link'" (2022) 3 *Journal of International Banking and Financial Law* 161.

[1258] Or potentially stronger, depending on how the specific crypto-token system technology is used and one's perspective on the infallibility of such technology.

Service Provider Act (the "Liechtenstein Token Act").[1259] Article 2 of the Liechtenstein Token Act defines "Tokens" in a similar way to the way this consultation paper describes a crypto-token: "Tokens" are described as "as a new legal object for representing rights of all kinds".[1260] The Liechtenstein Token Act acknowledges that a Token might not be linked to any asset external to the TT System, or that a Token can "represent claims or rights of memberships against a person, rights to property or other absolute or relative rights".[1261]

14.47 Importantly, article 7(1) of the Liechtenstein Token Act provides that "Disposal over the Token results in the disposal over the right represented by the Token." This article creates a clear statutory "link" between a crypto-token and a thing external to a crypto-token system.

14.48 Article 7(2) attempts to strengthen the link further. It provides that:

> If the legal effect under [Article 7(1)] does not come into force by law, the person obliged, as a result of the disposal over the Token, must ensure through suitable measures that:
>
> a) the disposal over a Token directly or indirectly results in the disposal over the represented right, and
>
> b) a competing disposal over the represented right is excluded.

14.49 The effect of article 7 is that the statute strengthens the link between a crypto-token and a thing external to the crypto-token system in two ways by reference to how transfers are effected.[1262] First, articles 7(1) and 7(2)(a) work in a "positive" way. Together they create a strong "positive" link by explicitly stating that the transfer of a crypto-token works to effect a transfer of the linked thing and by imposing additional statutory obligations on persons to effect such a transfer as a practical matter. Second, it works in a "negative" way as article 7(2)(b) is designed to prevent competing transfers; in other words, to prevent title to the linked thing being transferred in another way.

14.50 The Liechtenstein Token Act recognises that neither the "positive" nor "negative" dimensions of the link are perfect. First, whether a disposal over a crypto-token has

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[1259] Liechtenstein Law of 3 October 2019 on Tokens and TT Service Providers (Token and TT Service Provider Act) ("Liechtenstein Token Act"): https://www.regierung.li/files/medienarchiv/950-6-01-09-2021-en.pdf.

[1260] Unofficial Translation of the 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 (2019): https://impuls-liechtenstein.li/wp-content/uploads/2021/02/Report-and-Application-TVTG-extract.pdf p 55. Under art 2(c) of the Liechtenstein Token Act, a "Token" is defined as: "a piece of information on a TT System which (1) can represent claims or rights of memberships against a person, rights to property or other absolute or relative rights; and (2) is assigned to one or more TT Identifiers. A "TT System" is defined as a "Transaction system which allows for the secure transfer and storage of Tokens and the rendering of services based on this by means of trustworthy technology.". A "TT Identifier" is defined as "an identifier that allows for the clear assignment of Tokens".

[1261] Liechtenstein Token Act, art 2(c).

[1262] See para 14.42 above.

the simultaneous effect of disposal over the linked thing is likely to be a matter of national law. The guidance notes explicitly acknowledge this:[1263]

> [The Liechtenstein Token Act] can only have an effect on assets that are subject to Liechtenstein Law (e.g. a movable object located in Liechtenstein).

14.51 Second, the guidance notes to the Liechtenstein Token Act recognise the risk of de-synchronisation of digital (crypto-token) disposal and analogue/external (linked thing) disposal. The Liechtenstein Token Act does not specify in detail how persons are to fulfil their obligations under articles 7(2)(a) and (b). However, the report suggests practical examples, such as:[1264]

> If a token is to represent a right to a movable object (e.g. diamonds), the owner of the physical item will have to deposit it, for example, at a warehouse. In the case of securities, it should usually suffice if the terms of issue stipulate that disposal over the securities is subject to the rules of a TT system.

14.52 To supplement these ideas, the Liechtenstein Token Act introduces the concept of a "Physical Validator".[1265] The main function of the Physical Validator is to ensure the link between the external thing and the crypto-token. Although the report on the Liechtenstein Token Act acknowledges that a Physical Validator will be complex,[1266] it suggests that the role might be used for some or all of the following:[1267]

(1) identification of the thing of value (for example, serial number, certificates);

(2) storage location, storage conditions (for example, securing the access);

(3) identification of the client and ensuring that the client is also the lawful owner of the thing of value; and

(4) avoiding conflicts of rights (ensuring that the thing of value is not already encumbered "offline", for example by liens).

14.53 Using a Physical Validator is simply one way in which the imperfect statutory link between the crypto-token and the thing external to the crypto-token system could be strengthened. Nevertheless, even where the link is created by a statute and seems strong, there remains a risk that the thing external to the crypto-token system is not transferred (or is transferred) out-of-sync with the crypto-token. So, as Professor

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[1263] Unofficial Translation of the 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 (2019) pp 59-60: https://impuls-liechtenstein.li/wp-content/uploads/2021/02/Report-and-Application-TVTG-extract.pdf.

[1264] Above p 60.

[1265] A Physical Validator is defined as "a person who ensures the enforcement of rights in accordance with the agreement, in terms of property law, represented in Tokens on TT systems" (section 2(1)(p)). The Liechtenstein Token Act envisages that the Physical Validator is an important role that would require registration and compliance with certain minimum capital requirements.

[1266] See Unofficial Translation of the 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 (2019) p 99: https://impuls-liechtenstein.li/wp-content/uploads/2021/02/Report-and-Application-TVTG-extract.pdf.

[1267] Above p 68.

Gullifer QC suggests, "the system is not entirely fool proof even with this type of legislation".[1268]

14.54 But the statutory link is nonetheless very strong. The statute caters well for the "positive" dimension of transfers of linked things. And it suggests practical methods for dealing with the risks posed by the imperfections of the restrictions on the "negative" dimension of transfers. For example, it suggests that a Physical Validator might contract with the factual possessor of a linked tangible thing, to regulate the obligations of the factual possessor. One suggestion is that a factual possessor of a tokenised watch might be obliged to take out insurance against theft or loss of the watch.[1269] This is not just a theoretical example: many organisations already exist which aim to solve some of the problems associated with tokenising tangible things. An example is the Mattereum Asset Passport NFT which aims to tokenise gold bars and includes a set of contractual warranties about the gold bar associated with the NFT. The NFT specifically identifies the gold bar to which it is linked, the vault location, the custodian, the insurance details and certificate, a dispute resolution mechanism, and a carbon-offsetting certificate in relation to the gold bar.[1270]

14.55 With respect to registers or records for shares, securities, and other registered intangible assets, market participants can estimate or quantify the level of risk that the register does not accurately reflect legal title to the asset.[1271] The same would be true if crypto-tokens/crypto-token systems were used as registers or records. Similarly, where a statute explicitly provides for a link between a crypto-token and a thing external to the crypto-token system, the link will be imperfect. This is because, as discussed above, the crypto-token or crypto-token system may not always accurately reflect the external legal and factual circumstances. However, market participants should be able to strengthen the link through additional contractual arrangements and protections if they so choose. They also should to be able to estimate or quantify the level of risk that the link between the crypto-token and the thing external to the crypto-token system is broken, or de-synched in some way.[1272] They can then price-in that risk as part of their business or economic activity.

14.56 In simple terms, then, we think that it is possible for legislation to create a statutory link between a crypto-token and a thing external to the crypto-token system. The statutory link would be imperfect. But it would nonetheless constitute a very strong

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[1268] Professor Louise Gullifer QC discussed these options in "The private law of digital assets: what is it and what should it be?", Gray's Inn Annual Birkenhead Lecture (15 November 2021): https://www.graysinn.org.uk/app/uploads/drupal-media/documents/education/The%20private%20law%20of%20digital%20assets%2017.11%20-%20Birkenhead%20Lecture.pdf.

[1269] See Unofficial Translation of the 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 (2019) p 69: https://impuls-liechtenstein.li/wp-content/uploads/2021/02/Report-and-Application-TVTG-extract.pdf.

[1270] See, for example, "Mattereum Asset Passport, Valcambi Suisse Gold Bar - 100g - Vector 777": https://passport.mattereum.com/ntfa.20210319.100.alpha.001.150768/.

[1271] In general, market participants would achieve this through a combination of market experience and/or legal and financial advice.

[1272] For example, where a linked, external thing is transferred without a corresponding transfer of the linked crypto-token.

link, and the strength of that link would be reflected by the willingness (or otherwise) of market participants to participate in transactions that rely on the link.

14.57 We do not think that is necessary or appropriate for Parliament to enact broadly-defined legislation containing this type of statutory link (such as the Liechtenstein Token Act) at this time. Rather, we think that, as practice develops in particular areas, specific, limited legislation might be appropriate and/or necessary to establish the relevant statutory links — one example being if it was thought appropriate to move to a data object-based land registration system.

Contractual and other legal arrangements

14.58 Commercial parties might seek to establish a system in which legal title to (or alternatively control of) a given crypto-token (as recorded by the state of the crypto-token system)[1273] is "strong or best evidence" of legal title to the linked thing.[1274]

14.59 In particular, market participants are likely to use various legal devices (whether they be contract, existing statute, or common law-based) to support the finality and integrity of transfer of title to crypto-tokens within crypto-token based market infrastructure. The legal solutions adopted are likely to be highly responsive to the operational model adopted by the relevant crypto-token system and the relevant requirements of its stakeholders. Those stakeholders would include participants themselves, the provider(s) of the crypto-token (if any) and any relevant supervisory authorities.[1275]

14.60 When considering how to characterise the link between a crypto-token and a linked thing it is therefore important to consider how market participants construct their arrangements. The characterisation of the link ought not to undermine the enforceability of, or public confidence in, such arrangements by creating legal uncertainty through an inappropriate or "one-size fits all" blanket characterisation.

14.61 As such, we consider that it is important for the law to recognise and protect the freedom of commercial parties to create bespoke contractual arrangements.

A crypto-token linked to intangible rights

14.62 A simple example of such a structure would be the following. A personal right, such as a right to be repaid, with a corresponding obligation on the payer to pay might exist outside a crypto-token system. It would, however, be possible, as a matter of contract, to create the obligation to pay in such a way that it could only be discharged by payment to the holder of the crypto-token linked to that personal right to be repaid. For example, in an issue of debt securities, the terms of the debt securities could provide that the obligation to pay is discharged only if the payment is made to the holder of the

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[1273] We discuss the concept of the "state" of a crypto-token system in Chapters 12 and 13 and the concept of control in Chapter 11.

[1274] Professor Louise Gullifer QC "The private law of digital assets: what is it and what should it be?", Gray's Inn Annual Birkenhead Lecture (15 November 2021): https://www.graysinn.org.uk/app/uploads/drupal-media/documents/education/The%20private%20law%20of%20digital%20assets%2017.11%20-%20Birkenhead%20Lecture.pdf.

[1275] City of London Law Society, "Digital assets: the limits of the concept of possession" (2021) p 7 n 16: https://www.citysolicitors.org.uk/storage/2021/08/Digital-Assets-The-Limits-of-the-Concept-of-Possession-13-08-21.pdf.

relevant linked crypto-token.[1276] This would be what we describe above as the "positive" element of the link.

14.63 To prevent any purported assignment of the right to enforce the benefit of the obligation to repay (either in equity or under section 136 of the Law of Property Act 1925) the terms and conditions of the debt issuance should also explicitly restrict any assignment of the debt to anyone who does hold the linked crypto-token.[1277] This would constitute the "negative" element of the link (see paragraph 14.42, above). This kind of structure could be used for other types of contractual rights.

14.64 In an issuance of new debt securities, it should be relatively straightforward to ensure that all parties are aware of, and agree to, the terms of the debt issuance, including the terms relating to transfer of the crypto-token and the linked rights. It should also be straightforward to ensure that any subsequent purchasers are aware of, and agree to, the terms and conditions of the debt issuance. For example, the terms and conditions of the debt securities could form part of the crypto-token itself. As we argue above, a crypto-token is capable of including an information set that is linked to, or associated with, that crypto-token. The terms and conditions of the debt issuance could form part of this linked or associated information set.

14.65 In this example, the link between the crypto-token and the linked thing would be constituted as a matter of contract.[1278] To strengthen the legal analysis of the link, the terms and conditions should also specify how transfers of the crypto-token are intended to effect a transfer of the linked rights. For example, the instrument of transfer would be the method of transfer specific to the crypto-token/crypto-token system itself. The terms and conditions should also specify how the parties thereto intended to treat a transfer. In Chapters 12 and 13, we argue that the best way of describing a legal transfer is by reference to a transfer operation that effects a state change, but that control over a crypto-token and the legal rules on derivative transfers of title will also be important.[1279]

14.66 The strength of the link between the crypto-token and the linked rights would, therefore, largely depend on the detail and specificity of the underlying contractual arrangements. Nevertheless, it is certainly possible to create a strong link between a crypto-token and a linked intangible right as a matter of contract.

A crypto-token linked to an equitable interest

14.67 A similar approach could be taken in respect of equitable beneficial entitlements external to a crypto-token system. An equitable entitlement could be recorded or represented by a crypto-token, following our record/register analysis above. As we

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[1276] Professor Louise Gullifer QC "The private law of digital assets: what is it and what should it be?", Gray's Inn Annual Birkenhead Lecture (15 November 2021): https://www.graysinn.org.uk/app/uploads/drupal-media/documents/education/The%20private%20law%20of%20digital%20assets%2017.11%20-%20Birkenhead%20Lecture.pdf.

[1277] Above; M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 5-026.

[1278] And in many ways, if the terms of the debt securities provide that the obligation to pay is only discharged if the payment is made to the holder/controller of the relevant linked crypto-token, then the crypto-token would function much like a documentary intangible.

[1279] See Chapter 12 from para 12.63 and Chapter 13 paras 13.17 to 13.22 for more detail on these points.

discuss in more detail in Chapter 16, a trust could rely on the distributed ledger or structured record in which the tokens were recorded as a register of equitable interests. The trustee could use the relevant crypto-tokens system as a mechanism for managing the distribution of benefits to and the retention, use and transfer of such equitable interests. We discuss whether such arrangements would be subject to the formalities requirements in section 53(1)(c) LPA 1925 in more detail in Chapter 17.

14.68 Alternatively, equitable entitlements could be linked to crypto-tokens themselves and a transfer of the linked equitable entitlement effected by a transfer of the linked crypto-token. We discuss whether such a transfer would be subject to the formalities requirements in section 53(1)(c) LPA 1925 in more detail in Chapter 17.[1280]

A crypto-token linked to a tangible thing

14.69 It is also possible to purport to create a link between a crypto-token and a tangible thing. Clearly, tangible things exist externally to a crypto-token system.

14.70 The broad purpose of linking a crypto-token to a tangible thing is to facilitate trading in, and liquidity in respect of, that tangible thing, by allowing a transfer of the linked crypto-token to effect a legal transfer of the tangible thing itself.[1281]

14.71 In the context of linking an intangible right to a crypto-token, we suggested that it is possible as a matter of contract to:

(1) specify that an obligation can only be discharged by performance of that obligation to (or in respect of) the holder of the crypto-token to which the corresponding right is linked (the "positive" element of the link); and

(2) explicitly restrict any assignment of the rights to require performance of the obligation to anyone who is not a holder of the linked crypto-token (the "negative" element of the link).

14.72 Each of these elements is more difficult in the context of tangible things.

14.73 First, in the context of the positive element of the link, it is certainly possible for parties to agree the method and time at which title to goods can pass. Section 17(1) of the Sale of Goods Act 1979 provides that:[1282]

[1280] We also note that priority disputes between competing assignments of an equitable interest (one by transfer of a linked crypto-token, one by an off-chain assignment) might arise and general legal principles relating to notice of assignment would need to be considered by reference to, among other things, the records of a crypto-token system.

[1281] Professor Louise Gullifer QC "The private law of digital assets: what is it and what should it be?", Gray's Inn Annual Birkenhead Lecture (15 November 2021), https://www.graysinn.org.uk/app/uploads/drupal-media/documents/education/The%20private%20law%20of%20digital%20assets%2017.11%20-%20Birkenhead%20Lecture.pdf. See also Hernando De Soto, who argues that capital is important to modern property systems and the idea of capital captures "the physical dimension of assets as well as their potential to generate surplus value": H De Soto, *The Mystery of Capital* (2001) p 38.

[1282] Section 17(2) of the Sale of Goods Act 1979 states that for the purposes of ascertaining the intention of the parties "regard shall be had to the terms of the contract, the conduct of the parties and the circumstances of the case".

> Where there is a contract for the sale of specific or ascertained goods the property in them is transferred to the buyer at such time as the parties to the contract intend it to be transferred.

14.74 Therefore, it is possible that parties can together agree that the legal title to a tangible thing in question transfers on transfer of the crypto-token to which it is linked.[1283] It would even be possible to infer this from the conduct of the parties in the absence of express terms.[1284] So even the mere act of "tokenising" a tangible thing — creating a crypto-token that was purportedly linked to that tangible thing — could provide (partial) evidence of the parties' intentions that a transfer of the tangible thing would occur on transfer of the linked crypto-token. Although the default rules in the Sale of Goods Act 1979 apply only to contracts for the sale of goods,[1285] it is likely that similar rules apply to other contracts where property in goods passes for good consideration, such as barter or exchange.[1286] Therefore, this analysis is likely to apply even where the consideration for the crypto-token was not money, but was some other crypto-token such as ether.

14.75 Because any rights that are purportedly linked to a crypto-token are intangible and do not have a physical presence, it is possible to specify in the contractual terms that create those rights exactly how and when they are in a factual sense to be transferred. It is also possible to specify that an obligation can only be discharged by performance of that obligation to (or in respect of) the holder of the crypto-token to which the corresponding right is linked. As we discuss above, the crypto-token can include or be linked to this information. However, it is more difficult to achieve this level of certainty with tangible goods. While persons might contractually agree how they intend the legal transfer of a tangible thing to take effect, it is more difficult as a practical matter effectively to link this agreement (or information about it) to the tangible good itself. For example, parties could agree that a legal transfer of a physical thing would only take effect by a transfer of a linked crypto-token, but that agreement would not be intrinsic to the linked physical thing itself. In this way, the "positive" element of the link between a crypto-token and a tangible thing could be considered weaker than between a crypto-token and certain intangible things.

14.76 Second, creating the "negative" element of the link between a crypto-token and a tangible thing is more difficult. We suggest above that, in the context of contractual rights, it is possible for the contractual terms to restrict explicitly any assignment of the

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1283 As we discuss in Chapter 12, we consider that the best way of describing a factual transfer of a crypto-token is by reference to a transfer operation that effects a state change, but that control over a crypto-token and the legal rules on derivative transfers of title will also be important in respect of a legal transfer. Parties would therefore need to be clear on their description of what did and did not constitute a "transfer" of a crypto-token for the purposes of effecting a legal transfer of the linked tangible thing.

1284 Although the other elements of section 17(2) would also need to be considered.

1285 Where one party agrees to transfer property in goods in exchange for money: Sale of Goods Act 1979, s 2.

1286 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 19-033, referring to *Koppel v Koppel* [1966] 1 WLR 802; *Flynn v Mackin* [1974] IR 101; *Aldridge v Johnson* (1857) 7 E & B 885; 119 ER 1476 (QB).

right to any person who did not hold the linked crypto-token.[1287] The issue is not as straightforward for tangible things. Property rights in relation to goods can be transferred by a sale without delivery.[1288] So, it will always remain possible for a person who has tokenised a tangible thing to sell that tangible thing to someone else, without selling the linked crypto-token.

14.77 Professor Gullifer QC gives the following example:[1289]

> Let us take a bar of gold. Alice could purport to link that specific bar of gold to a [crypto-token]. Alice could then agree and evidence in writing that the transfer of the [crypto-token] linked to the bar of gold would effect a transfer of the bar of gold itself.
>
> The legal title to the bar of the gold and the [crypto-token] will start off synchronously — Alice would hold good legal title to both the bar of gold and the linked [crypto-token]. If Alice transfers both the bar of gold and the linked [crypto-token] to Bob, then this would retain the link between the two. The problem is that, unlike with the [contractual rights example we discuss at paragraph 14.62 above], there is no way to make the gold incapable of transfer to a person except to the holder of the linked [crypto-token]. So there would be nothing to stop Bob factually transferring the linked [crypto-token] to Caroline and separately selling the gold to Dan. Bob would not even need to transfer possession of the specific gold bar to Dan because property in goods can be transferred by sale without delivery.
>
> Of course, Alice could require Bob to make a contractual promise not to transfer the specific bar of gold to a person who was not also the transferee of the linked [crypto-token] as a condition of her sale of the gold to Bob. But that contractual promise will only give Alice personal rights against Bob and won't bind third parties such as Dan. So the link between the [crypto-token] and the specific gold bar can be broken, so that Caroline, as the transferee of the [crypto-token], has no proprietary interest in the gold bar, and only has a claim against Bob for breach of contract.

14.78 So, on its face, a link between a tangible thing and a crypto-token seems reasonably weak. This is because it is not straightforward to prevent legal title to tangible goods from transferring separately to the crypto-token to which they are linked.

14.79 However, there are many ways to strengthen the link as a practical matter. For example, a combination of physical and legal conditions might help to prevent the legal title to the goods from transferring separately to their linked crypto-token. An example is that the gold bar could be stored in a secure location by a trusted custodian. The custodian could contractually agree only to make actual or constructive

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[1287] Professor Louise Gullifer QC "The private law of digital assets: what is it and what should it be?", Gray's Inn Annual Birkenhead Lecture (15 November 2021): https://www.graysinn.org.uk/app/uploads/drupal-media/documents/education/The%20private%20law%20of%20digital%20assets%2017.11%20-%20Birkenhead%20Lecture.pdf; M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 5-026.

[1288] Sale of Goods Act 1979, s 17.

[1289] Professor Louise Gullifer QC "The private law of digital assets: what is it and what should it be?", Gray's Inn Annual Birkenhead Lecture (15 November 2021): https://www.graysinn.org.uk/app/uploads/drupal-media/documents/education/The%20private%20law%20of%20digital%20assets%2017.11%20-%20Birkenhead%20Lecture.pdf.

delivery of the gold bar to the current holder of the linked crypto-token.[1290] The gold bar could also be insured against loss, theft, or destruction. In that situation, the gold bar would still be vulnerable to a well-planned heist. The custodian might still act in breach of contract. The gold bar could still be destroyed in an unfortunate smelting accident. However, the practical effect of the legal link between the gold bar and the crypto-token would be strengthened because of the combination of the additional physical and legal constraints on its transfer other than by transfer of the linked crypto-token. The link would not be perfect. But again, market participants might consider that there is an acceptable level of legal and practical risk that they are willing to tolerate to obtain the benefits of being able to transfer the gold bar by a transfer of the crypto-token. This situation is analogous to the current legal framework with respect to physical goods and documentary intangibles. Where a bill of lading gives constructive possession — or the right to immediate possession — of the tangible thing to be delivered, there nonetheless remains a risk that the tangible thing could be sold to someone else, stolen or destroyed. While this might give rise to causes of action and related remedies in respect of those tangible things, it does not necessarily mean that the tangible things themselves could be recovered, or that the link between the tangible thing and the documentary intangible was not destroyed. We discuss causes of action and related remedies in more detail in Chapter 19.

14.80 As we discuss at paragraphs 14.19–14.43 above, a crypto-token could also be linked to a tangible thing in other ways. For example, the crypto-token could simply be used as a record or register of the tangible thing. Depending on how the record or register was designed, this may or may not provide evidence as to the legal title holder of the linked tangible good.

14.81 A simple example is the where a crypto-token/crypto-token system is used to record or register details about a certain product, such as diamonds or fine wine. In the case of diamonds, the crypto-token might be used to record details of the specific, linked diamond, such as compliance documentation, origin, planning, and cutting events of each diamond.[1291] In these circumstances, holding the crypto-token would not confer any additional legal rights or provide any evidence as to the legal title holder of the linked diamond.

14.82 A more complex example would be where a crypto-token was used as a record or register that was intended to provide evidence as to the holder of (or even to constitute) legal title to the linked tangible thing. As we discuss at paragraph 14.32 above, in these circumstances, it would be possible to create a very strong link between a crypto-token and a tangible thing. This would particularly be the case where transfer of the tangible thing required additional steps such as the completion of formalities or the entry into a register, and the execution of those formalities or registration was only possible with transfer of the linked crypto-token. Indeed, the example we provide above relates to land — a tangible thing.

14.83 Finally, as we discuss at [paragraphs 14.93–14.97 below, it is possible that a crypto-token could be treated by market participants as a documentary intangible. In those

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[1290] In those circumstances, a purported, off-chain sale of the gold bar to another person could still theoretically take place, but the gold would remain with the custodian while any title disputes took place.

[1291] See, for example, Everledger at https://everledger.io/industry-solutions/diamonds/.

circumstances, the holder of the linked crypto-token would have constructive possession — or the right to immediate possession — of the tangible thing to which it was linked.[1292] And transfer of the crypto-token could be used by the seller to "deliver" the linked tangible thing to the buyer under the contract of sale.[1293] In this sense, the crypto-token could be used to perform the delivery obligation in respect of the tangible thing under the contract of sale and a valid transfer of the crypto-token to the buyer would be a key element of such performance. However, given the difficulties with the documentary intangible analysis that we discuss above, we would expect that market participants attempting to recreate such a structure would need to specify the legal relationships and expectations as a matter of contract. A documentary intangible

14.84 In this section, we discuss the current law relating to "documentary intangibles" and whether it is helpful or appropriate to draw analogies between existing documentary intangibles and crypto-tokens that are linked to rights external to a crypto-token system.

14.85 It is not unusual to reduce performance obligations to writing and to record them in documents. Contracts are a simple example. Commercial practice has, however, resulted in certain types of document being elevated beyond a simple *record* of obligations in writing to something more — an *embodiment* of the right to claim performance of the obligations recorded in the document.[1294]

14.86 An example of this is a bill of exchange: a written order by one person to pay a certain sum of money to a specified person or to their order. Significantly, the right to claim performance of the obligation to pay the sum of money is not merely evidenced by, but is embodied by, the physical bill.

[1292] See Electronic Trade Documents (2022) Law Com No 405 para 3.20 and *Lickbarrow v Mason* (1787) 2 TR 63 at 100 ER 35; *Barber v Meyerstein* (1870) LR 4 HL 317 at 332; *Sanders Bros v McLean* (1883) 11 QBD 327 at 341.

[1293] See Electronic Trade Documents (2022) Law Com No 405 paras 3.20 and 6.17.

[1294] The right to claim performance of the obligations recorded in the document are generally transferable, either by way of pledge or by means of delivery of the document itself. See M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 5-001. For more detail see Electronic Trade Documents (2022) Law Com No 405 ch 3. Similarly, art 3 Uniform Commercial Code reifies payment rights in certain paper "negotiable instruments", providing that a person in possession of the paper has the right to enforce the payment right evidenced by that instrument: see § 3-301 of the Uniform commercial Code. See also J Moringiello and C Odinet, "The Property Law of Tokens" *Florida Law Review* (Forthcoming 2022): https://ssrn.com/abstract=3928901.

14.87 Sometimes these documents, as a broad class, are referred to using the umbrella term "documentary intangibles".[1295] The idea behind the commercial practice and legal recognition in relation to documentary intangibles is simple:[1296]

> A document, which is easy to transfer, can effect the transfer of some thing that it is not easy to transfer by locking up the right to the thing in that document.

14.88 As we discuss in our report on electronic trade documents,[1297] these types of document can be issued either as "bearer documents" or as "order documents". This determines the method of transfer used to transfer the document.[1298] Critically, the transfer of such a document does not require the consent of any other party, nor does it require any actions to be taken other than those described in the footnote above. In the case of both bearer documents and order documents, the right to claim performance of the relevant obligation simply "travels with the document".[1299]

14.89 The rules governing the effects of issue and transfer of documentary intangibles have their origins in the medieval law merchant, a transnational body of customary law, which eventually integrated itself into the domestic laws of different states.[1300] These origins are significant because they mean that documentary intangibles have substantially the same legal effects wherever in the world they are used.

14.90 The concept of a documentary intangible seems well-suited to the situation in which a crypto-token is linked to a thing external to the crypto-token system.[1301] By analogy

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[1295] The term "documentary intangibles" was first coined by Sir Roy Goode QC in the Crowther Report on Consumer Credit (1971) vol 2 p 577. In our report on electronic trade documents we described a documentary intangible as "a document that entitles the holder to claim performance of the obligation recorded in the document and to transfer the right to claim performance of that obligation by transferring the document. The document is said to "embody" the obligation." See Electronic Trade Documents (2022) Law Com No 405.

[1296] Professor Louise Gullifer QC "The private law of digital assets: what is it and what should it be?", Gray's Inn Annual Birkenhead Lecture (15 November 2021): https://www.graysinn.org.uk/app/uploads/drupal-media/documents/education/The%20private%20law%20of%20digital%20assets%2017.11%20-%20Birkenhead%20Lecture.pdf.

[1297] Electronic Trade Documents (2022) Law Com No 405.

[1298] In a bearer document, the obligation is owed to whoever is in possession of the document. To transfer a bearer document, the bearer simply delivers the document to another party. In an order document, the obligation is owed to a person named on the document. To transfer an order document, the person in possession of the document must indorse the document. M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 5-008. For a discussion on analogies between transfers of crypto-tokens and other types of transfer see Chapter 12. See also Electronic Trade Documents (2022) Law Com No 405 paras 3.59 to 3.63.

[1299] R Goode and E McKendrick, *Goode and McKendrick on Commercial Law* (6th ed 2020) para 2.58.

[1300] For a detailed consideration of this, see: J Moringiello and C Odinet, "The Property Law of Tokens" *Florida Law Review* (Forthcoming 2022): https://ssrn.com/abstract=3928901, referencing WS Holdsworth, "The Origins and Early History of Negotiable Instruments I" (1915) 31 *Law Quarterly Review* 12, 13 (discussing bills of exchange as a method of "effecting an exchange of money without incurring the risks of its physical transportation").

[1301] "This idea, then, maps quite well onto the exogenous digital asset situation, since we have something of no real value in itself, the transfer of which transfers a valuable right.", Professor Louise Gullifer QC, "The private law of digital assets: what is it and what should it be?", Gray's Inn Annual Birkenhead Lecture (15

with documentary intangibles, a crypto-token could be treated as the "document". Instead of being constituted as a paper document, it would be constituted as a crypto-token. And the "link" between the crypto-token and the right to claim performance of the obligations recorded by the crypto-token would be that the crypto-token "embodies" those rights. This is theoretically a very strong link, because the crypto-token becomes inseparable from the embodied rights to claim performance of the corresponding obligations. We took this approach in our report on electronic trade documents and argued that electronic trade documents (under our proposed Bill) would be capable of embodying rights to claim performance of the corresponding obligations recorded in the document.[1302]

14.91 Indeed, this is broadly how current documentary intangibles function — as "tokens". Moringiello and Odinet suggest (in the context of a bill of lading) that:[1303]

> In essence, the chief function of the bill of lading is that is serves as 'a legal embodiment of the rights to the goods described therein.' It is a true token — it embodies the legal rights in the goods being shipped. The carrier will only deliver the goods to the person so designated in the document. The bill of lading is the token and the holder of it has the exclusive rights in the goods.

14.92 However, there are three broad problems with applying this line of reasoning to crypto-tokens/crypto-token systems under current law:

(1) In general, the law in relation to documentary intangibles developed by mercantile custom, aided by statutory intervention (such as the Bills of Exchange Act 1882), both of which are unlikely to apply to crypto-tokens at present.

(2) The law relating to documentary intangibles uses the concept of possession, and we suggest in Chapter 11 that control is a more appropriate concept to apply to data objects.

(3) The law would need to draw analogies between the ways in which transfers of documentary intangibles and transfers of crypto-tokens work in practice.

We consider each issue below.

Mercantile custom or statute is required

14.93 The first problem is that it took hundreds of years for the law on documentary intangibles to develop. Bills of exchange (a specific type of documentary intangible) were introduced to England and Wales through international trade with Europe at least by the late 17th century. Once bills of exchange became a popular instrument used by

November 2021): https://www.graysinn.org.uk/app/uploads/drupal-media/documents/education/The%20private%20law%20of%20digital%20assets%2017.11%20-%20Birkenhead%20Lecture.pdf.

[1302] "There is a fundamental distinction between the electronic trade document, which is the document that embodies rights, and a copy which does not carry with it any rights." See Electronic Trade Documents (2022) Law Com No 405 para 5.107.

[1303] J Moringiello and C Odinet, "The Property Law of Tokens" *Florida Law Review* (Forthcoming 2022): https://ssrn.com/abstract=3928901.

traders in both foreign and domestic trades, the courts began to give them legal effect as part of the common law.[1304] Most of this law was later codified in the Bills of Exchange Act 1882 which remains in force. The common law rules continue to apply so long as they are not inconsistent with the provisions of the Bills of Exchange Act 1882.[1305] So, broadly, what counts as a documentary intangible remains, at common law, a matter of mercantile custom unless covered by the Bills of Exchange Act 1882. In the absence of mercantile custom, there needs to be a statute.

14.94 It is possible that mercantile custom could evolve in relation to crypto-tokens. Given the size and growing importance of the crypto-token industry, the evolution of mercantile custom need not take hundreds of years. However, there are myriad implementations of crypto-tokens, many different ways in which those crypto-tokens are used and treated by market participants, a relative dearth of case law, and continuing regulatory inconsistency in relation to crypto-tokens. This makes it very difficult to suggest that mercantile custom has arisen to date such that crypto-tokens should be treated as documentary intangibles. Indeed, in many cases, crypto-tokens will not be used in a way that is similar to a documentary intangible — for example, where a crypto-token or crypto-token system is used as a register or record (see paragraphs 14.19–14.43 above). It is more likely that mercantile custom could be said to have evolved in relation to a particular sub-set of crypto-tokens, such as collectible or art related non-fungible tokens ("NFTs"). However, even that is highly unlikely at this stage, given the many different types, uses and interlinked terms and conditions.[1306]

14.95 Today, there is no statute that recognises that a crypto-token can be a documentary intangible (or something analogous with a documentary intangible) under the law of England and Wales.[1307] Internationally, it is arguable that the Liechtenstein Token Act (discussed in detail from paragraph 14.46 above) has a similar effect to a statute that would recognise a crypto-token as a documentary intangible. The principal difference seems to be that, under the Liechtenstein Token Act, the link between the crypto-token and the thing external to the crypto-token system is constituted by a statutory provision.[1308] This is probably because the Liechtenstein Token Act covers both linked rights and linked tangible things. Nevertheless, the effect of the Liechtenstein Token Act is similar to the effect of a statute that would recognise a crypto-token as a documentary intangible.

14.96 Our report on electronic trade documents recommended a new bill that provides that an electronic version of a trade document should have the same effect at law as a

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1304 *Goodwin v Robarts* (1875) LR 10 Exch 337.

1305 Bills of Exchange Act 1882, s 97(2).

1306 We discuss how NFTs can be linked to external legal rights in greater detail in para 15.25 below.

1307 However, see para 14.96 below for discussion on the proposed Electronic Trade Documents bill.

1308 In contrast, a statute which recognised certain crypto-tokens as being a documentary intangible could do just that. Other statutory and common law provisions would then apply to such crypto-token, including that the crypto-token was an embodiment of the right to claim performance of the obligations recorded in the crypto-token. This is how the proposed Electronic Trade Documents Bill is structured. Electronic Trade Documents (2022) Law Com No 405, Appendix 4.

paper version of that document.[1309] The effect of the bill is limited to a specific class of existing paper trade documents.[1310] And an electronic version of a paper trade document must satisfy certain criteria.[1311] Within this limited scope, the bill aims to give certainty to market participants as to the legal effect of electronic trade documents, provided that they structure the electronic trade document to fall within the ambit of the statute.

14.97 That proposed bill focuses on a specific "digital asset" — electronic trade documents — which have a focused and narrowly-defined purpose and are used by specific market participants in the context of specific markets. As we discuss in our report, permitting the use of electronic trade documents is considered by those market participants as crucial to the smooth continuation of existing market practice in relation to trade documents. In contrast, crypto-tokens are multitudinous. They are used for many different purposes and in many different ways. The crypto-token market is (relatively) new and treating a crypto-token like a documentary intangible in every case is not, therefore, necessary or desirable for the smooth continuation of existing market practice.

Control/possession

14.98 A principal feature of paper documentary intangibles is that the paper document itself is capable of possession. The concept of possession is important for a number of reasons relating to the legal treatment and commercial functionality of paper trade documents.

14.99 However, in general, the law of England and Wales — like that of many other significant trade jurisdictions around the world — does not recognise intangible things as being amenable to possession. This means that crypto-tokens, which are generally considered to be intangible, cannot be possessed as a matter of law. The consequence of this is that difficulties arise in applying the concept of a documentary intangible (which the law assumes is capable of possession) to a crypto-token (which the law assumes is incapable of possession).

14.100 This is not necessarily a problem for the purposes of identifying the link between a crypto-token and a thing external to the crypto-token system. It is possible that the law could treat a crypto-token as "embodying" the right to claim performance of the obligations recorded by the crypto-token. As we discuss in more detail in Chapter 11, the concept of control, as applied to crypto-tokens, could then be treated as analogous with the concept of possession that currently applies to documentary intangibles.

Transfers by delivery

14.101 An important legal feature of documentary intangibles is that they modify the transferability of the right to claim performance of the obligations that the document

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[1309] Electronic Trade Documents (2022) Law Com No 405 para 8.8.

[1310] Above paras 4.49–4.51.

[1311] Above ch 6.

"embodies".[1312] Instead of transferring the right by way of assignment, a transfer of the legal title to the right takes effect on delivery of the physical document.[1313]

14.102 For example, the right to enforce payment of a bill of exchange is given only to the holder.[1314] The rights under a bill can, like any other thing in action, be transferred by assignment, with notice of assignment to the acceptor. However, as Professor Goode argues:[1315]

> Such a procedure has nothing to commend it, for since the acceptor is not obliged to make payment to anyone other than the holder, he can safely disregard a notice of assignment, and all that the assignee acquires is an equitable title to the instrument, so that he takes subject to equities and cannot sue in his own name.

14.103 In other words, in general, any attempt to assign the rights to claim performance of the obligations that a bill of exchange embodies separately from delivery of the bill of exchange is ineffective to transfer legal title to those rights.[1316]

14.104 These rules exist because otherwise the same person (X) could attempt to "double spend" the rights to claim performance of the obligations a documentary intangible embodies. This could be effected by X transferring those rights to A by way of assignment without handing over the document, and then separately "transferring" the rights to B by delivery of the documentary intangible. Absent clear legal rules to prevent this outcome, this would result in a "double spend", or at least a conflict between A and B.[1317]

14.105 So instead the legal rules of transfer of a documentary intangible focus on physical delivery. Professor Goode QC summarises the position in respect of a bearer bill:[1318]

> Anyone into whose hands the bill comes (whether lawfully or otherwise) is the holder and as such is able to present the bill for payment to the acceptor on its maturity; and provided that the acceptor acts in good faith and without notice of a defect in the holder's title, the acceptor gets a good discharge by payment of the bill, even if the

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[1312] H Liu, "The legal nature of blockchain securities" (2021) *Lloyd's Maritime and Commercial Law Quarterly* 476, 481.

[1313] In general, bearer documents are transferrable by mere delivery, whereas order documents are transferrable by indorsement and delivery: M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 5-008.

[1314] R Goode and E McKendrick, *Goode & McKendrick on Commercial Law* (6th ed 2020) paras 20.21 and 20.26. The Bills of Exchange Act 1882, s 2 defines the "holder" as "the payee or indorsee of a bill or note who is in possession of it, or the bearer thereof."

[1315] R Goode and E McKendrick, *Goode & McKendrick on Commercial Law* (6th ed 2020) para 20.20.

[1316] H Liu, "The legal nature of blockchain securities" (2021) *Lloyd's Maritime and Commercial Law Quarterly* 476 p 487, referencing M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (2nd ed 2019) paras 5-026-5-027.

[1317] H Liu, "The legal nature of blockchain securities" (2021) *Lloyd's Maritime and Commercial Law Quarterly* 476, 487.

[1318] R Goode and E McKendrick, *Goode & McKendrick on Commercial Law* (6th ed 2020) para 20.21.

person to whom he made payment stole the bill or is otherwise unlawfully in possession of it.

14.106 In that sense, a documentary intangible is both a document of title and an instrument of transfer. Delivery of possession of the document itself immediately, irrevocably and unconditionally transfers the value and the rights to claim performance of the obligations embodied in the document to the transferee.[1319]

14.107 But physical delivery of a crypto-token is difficult for two reasons. First and most obviously, crypto-tokens are not tangible things in the normal sense.[1320] Although we have recommended that electronic trade documents should be possessable, things which are treated as intangible are generally not possessable. So, if a crypto-token were to be treated as a documentary intangible, it would be necessary to draw an analogy between the way in which possession of a documentary intangible is transferred (by delivery) and the way in which legal title to a crypto-token is transferred (by reference to a transfer operation that effects a state change).[1321] We discuss this in more detail in Chapters 12 and 13.

14.108 The second difficulty with the concept of delivery of a crypto-token is that, as the UKJT observed: [1322]

> Although one can describe and conceptualise [an on-chain transaction] as a transfer, it is not really analogous to the delivery of a tangible object or the assignment of a legal right, where the same thing passes, unchanged, from one person to another. Instead, the transferor typically brings into existence a new [crypto-token], with a new pair of data parameters: a new or modified public parameter and a new private key.

14.109 We broadly agree with this observation and discuss the legal consequences for transfers of crypto-tokens in more detail in Chapter 13. However, it is clear that when effecting a "delivery" of a crypto-token, the crypto-token will not pass to the transferee unchanged.[1323] So again, to draw an analogy with a transfer by physical delivery, one would also need to describe a concept analogous to physical delivery that recognises the intrinsic technical features of a crypto-token. In addition, drawing analogies with the concept of delivery places a greater focus on the person with control of a crypto-token (as opposed to the (superior) legal title holder, if any). We discuss this in more detail in Chapter 13.

[1319] City of London Law Society, "Digital assets: the limits of the concept of possession" (2021): https://www.citysolicitors.org.uk/storage/2021/08/Digital-Assets-The-Limits-of-the-Concept-of-Possession-13-08-21.pdf p 2

[1320] See para 3.8.

[1321] We consider how possession of an electronic trade documents could be transferred from para 7.94 of Electronic Trade Documents (2022) Law Com No 405.

[1322] UK Jurisdictional Taskforce, *Legal Statement on cryptoassets and smart contracts* (November 2019): https://technation.io/lawtechukpanel/ ("UKJT Statement") para 45.

[1323] However, while a physical document will usually pass to the transferee unchanged, there may be circumstances in which its physical state will change on transfers. For example, where it is indorsed, gets wet or is otherwise damaged during transfer.

14.110 We consider that drawing analogies with the concept of a documentary intangible is likely to be both useful and intuitive for certain (but not all) types of crypto-tokens that are linked to a thing external to the crypto-token system. The analogy would be most appropriate in situations in which the linked rights are expressed (or intended) to transfer on a change of control of the linked crypto-token (which may or may not correspond to a transfer of the (superior) legal title to the crypto-token). While control is important in the context of crypto-tokens, market practice is not consistent as to whether linked rights transfer with transfer of control or only with transfer of (superior) legal title. Therefore, whether this analogy is useful will depend on the crypto-token in question, the external thing to which it is linked and how that link is constituted.

14.111 In addition, we have outlined three broad problems with this line of reasoning under current law. While we do not think that these problems are insurmountable, they do require the law to recognise the idiosyncrasies of crypto-tokens, crypto-token systems and the crypto-token markets, including how they operate as a technical matter.[1324]

Different links and the consequences for legal certainty

14.112 This chapter outlined different ways in which a link between a crypto-token and something else — normally external to a crypto-token system — can be constituted. It also described how the strength of any such link will vary depending on a number of factors, including the exact wording of any contractual terms or possible future legislative provisions relating to the link.

14.113 The variety of legal mechanisms for constituting a link between a crypto-token and a linked thing are likely to lead to different legal consequences. However, we think that the flexibility for market participants to structure their arrangements according to their business needs and preferences is characteristic of English and Welsh law. We also expect that over time the legal mechanisms for constituting links will gradually become more uniform as the crypto-token and cryptoasset markets develop. For this reason, we provisionally conclude that no law reform is necessary to clarify or specify the method of constituting a link between a crypto-token and something else — normally a thing external to a crypto-token system — or the legal effects of such a link. We would however be interested in consultees' views on this issue.

[1324] As we discuss in this consultation paper, we consider that recognising these differences and idiosyncrasies is important if the law is to recognise and protect the use of crypto-tokens and crypto-token systems. It is for these reasons, among others, that we consider that explicit recognition of a third category of personal property is an important legal development that will allow the law to evolve in a nuanced and flexible way.

Consultation Question 27.

14.114 Are there any other types of link between a crypto-token and a thing external to a crypto-token system that you commonly encounter or use in practice?

14.115 We provisionally conclude that market participants should have the flexibility to develop their own legal mechanisms to establish a link between a crypto-token and something else — normally a thing external to the crypto-token system. As such, we provisionally conclude that no law reform is necessary or desirable further to clarify or specify the method of constituting a link between a crypto-token and a linked thing or the legal effects of such a link at this time. Do you agree?

Chapter 15: Non-fungible tokens (NFTs)

INTRODUCTION

15.1 In this chapter, we consider non-fungible tokens ("NFTs"). From a private property law perspective, NFTs raise similar issues to other crypto-tokens. In fact, much of the legal, academic, and market-participant commentary on NFTs is aligned on the matter of their underlying constructs.[1325] However, given the increasing interest in the NFT market and their potential as a novel and flexible legal structuring tool, we think it is worth considering NFTs in more detail. We explain what they are and include an illustrative example. We also explain some of the common or possible misconceptions surrounding what a purchaser actually acquires when they buy an NFT.

15.2 It seems likely that NFTs will play an increasingly important role in modern online interactions. In particular, we think that NFTs will take a leading, exploratory role in establishing property rights in data objects in mainstream and retail use. Beyond that, perhaps the most radical legal development that NFTs could bring about is a change in how the market, market participants, and the legal system operate and transact with respect to intellectual property rights.

15.3 Our view is that the correct approach is to begin with the understanding that an NFT is a crypto-token that is capable of attracting personal property rights in itself. One can then work outward to find the limits of those rights, and where, for instance, they overlap or conflict with intellectual property rights or other contractual rights.[1326] In particular, NFTs allow us to explore how those rights can coexist alongside intellectual property interests.[1327]

WHAT IS AN NFT?

Tokens

15.4 NFTs are "tokens". In general, they are constituted as crypto-tokens and will therefore fall within our description of a crypto-token in this consultation paper. As we suggest

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[1325] Albeit not as to how NFTs could be used, or as to how useful NFTs are.

[1326] See J Fairfield, "Tokenized: The Law of Non-Fungible Tokens and Unique Digital Property" (2022) 97 Indiana Law Journal 1261, 1356: https://ssrn.com/abstract=3821102.

[1327] See A Perzanowski and J Schultz, "Reconciling Personal and Intellectual Property" (2015) 90 *Notre Dame Law Review* 1213, 1214: "Content owners, particularly in the software industry, have endeavoured to eliminate the personal property interests of consumers, redefining the notion of ownership by characterizing their transactions with consumers as licenses to use the works or the purchase of a license as opposed to the purchase of a copy. Because ownership triggers exhaustion, this approach has allowed rights holders to assert control over subsequent uses and transfers of those copies, unchecked by countervailing consumer property interests. And because digital media content, as both a legal and practical matter, is increasingly indistinguishable from software, the entire copyright economy could soon be governed by this same licensing regime.

throughout this paper, we think that a crypto-token is, in itself, capable of attracting personal property rights.[1328]

15.5 Legal and market commentary is almost unanimous in conceptualising NFTs as crypto-tokens. Professor Fairfield describes the process for creating NFTs within crypto-token systems:[1329]

> These distributed apps can in turn create their own token systems by initiating a smart contract (a program) that acts as its own registry, determining how many tokens exist, and who owns what.

15.6 Other legal and market commentators describe NFTs in a highly consistent way. NFTs have been described as:[1330]

> At the most basic level, a token in the DLT sense is a piece of code, which acts as an encryptable representation of the other object, and [in the case of NFTs] this code can be unique.

15.7 In addition, the High Court of England and Wales has recently held that there is an arguable case that NFTs are capable of attracting property rights in *Osbourne v Persons Unknown and Ozone Networks Inc*.[1331]

15.8 So the starting point for NFTs is that they fall within our description of a crypto-token.[1332] That is the "token" element of the term NFT.

Non-fungible

15.9 The "non-fungible" element of the term NFT is interesting. In a technical sense, it simply refers to the fact that each NFT is a numbered crypto-token — it has a particular token ID. The token ID is different for each token.

15.10 As we discuss in more detail in Appendix 3, the specific technical implementation of NFTs means that specific token IDs are tracked by the address within the crypto-token system that is associated with that particular token ID. In contrast, for "fungible"

1328 "The token grounds the property interest online just as the physical copy grounds it offline", see J Fairfield, "Tokenized: The Law of Non-Fungible Tokens and Unique Digital Property" (2022) 97 Indiana Law Journal 1261, 1358: https://ssrn.com/abstract=3821102.

1329 J Fairfield, "Tokenized: The Law of Non-Fungible Tokens and Unique Digital Property" (2022) 97 Indiana Law Journal 1261, 1283: https://ssrn.com/abstract=3821102.

1330 A Guadamuz, "The Treachery of Images: Non-fungible Tokens and Copyright" (2021) *Journal of Intellectual Property Law and Practice* 1369: https://ssrn.com/abstract=3905452. See also J Moringiello and C Odinet, "The Property Law of Tokens" *Florida Law Review* (Forthcoming 2022) 5: https://ssrn.com/abstract=3928901; G Shapiro, "Legalize NiFTies. Or, How I Learned to Stop Worrying and Love RarePepes" (2020): https://lexnode.substack.com/p/legalize-nifties; K Low, "The Emperor's New Art: Cryptomania, Art & Property" (2021) 17 and @punk6529: https://twitter.com/punk6529/status/1451896453065023493.

1331 *Osbourne v Persons Unknown and Ozone Networks Inc* [2022] EWHC 1021 (Comm); See further: R Pryor, "NFTs Recognised as 'legal property' in landmark case" (2022): https://www.theartnewspaper.com/2022/04/29/nfts-recognised-as-legal-property-in-landmark-case.

1332 See Chapter 10 and Appendices 3, 4 and 6.

crypto-tokens, only the overall balance/quantity of those crypto-tokens associated with a particular address is tracked.

15.11 For "fungible" crypto-tokens, you can only tell how many or how much of a fungible crypto-token is associated with a particular address. In contrast, for "non-fungible" crypto-tokens, because specific token IDs are tracked as opposed to balances of tokens, you can tell the exact token IDs of crypto-tokens that are associated with a particular address.

15.12 This is the idea behind the term "non-fungible": NFTs are unique because they have a unique token ID. This uniqueness is then taken one step further in the context of NFTs to get to the idea of non-fungibility. NFTs are said to be non-fungible in that they are not replaceable by another identical NFT (because there is no other identical NFT) and they are not mutually interchangeable (because no NFT is the same).

15.13 However, fungibility is not an absolute concept.[1333] Fungibility instead depends on what different parties are willing to accept as mutually interchangeable. In *Goode and McKendrick on Commercial Law*, the authors explore the concept of fungibility in detail and argue that:[1334]

> Fungibles are assets of which one unit is, in terms of an obligation owed by one party to another, indistinguishable from any other unit, so that a duty to deliver one unit is considered performed by the delivery of an equivalent unit.

15.14 Many assets or things that we think of as fungible are only fungible because different parties are willing to accept them as interchangeable. Fungibility is not an objective quality of a thing — it is a subjective quality, depending on the point of view of the parties that interact with the thing. For example, each individual grain of rice is different to each other grain, but parties will generally accept delivery of a certain quantity of rice, normally measured in weight. Parties do not normally specify which exact grains they wish to receive, instead they are willing to treat individual grains or rice as interchangeable. Similarly, parties will normally treat bank notes as being interchangeable, even though each bank note is individually numbered.[1335]

15.15 Therefore, NFTs are simply crypto-tokens that have an individual identification number. Whether or not NFTs are treated as "fungible" will depend only on what contractual counterparties are willing to accept as mutually interchangeable.[1336]

15.16 We suggest in Chapter 10 that crypto-tokens are capable of being objects of personal property rights. We see no logical or principled reason why crypto-tokens that have an

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[1333] K Low, "The Emperor's New Art: Cryptomania, Art & Property" (2021) 11.

[1334] R Goode and E McKendrick, *Goode and McKendrick on Commercial Law* (6th ed 2020) para 2.89. See also "A focus on physical features as a means of determining legal characterization is fundamentally flawed."…"Fungibility is thus fundamentally dependent on the particular obligation, usually contractual, rather than inherent to any property, tangible or otherwise." R Goode, "Are Intangible Assets Fungible?" [2003] Lloyd's Maritime and Commercial Law Quarterly 379, 383.

[1335] See D Fox, *Property Rights in Money* (2008) paras 1.78 to 1.81.

[1336] In this sense, it might be more accurate to take out the "F" and refer to NFTs simply as "NTs" — numbered tokens, or "NCTs" — numbered crypto-tokens. However, we use the term NFT in this consultation paper for consistency with common market use.

individual identification number ought to be treated any differently. Therefore, the starting point is that an NFT, as an individually identifiable crypto-token, is an appropriate object of property rights.

15.17 Again, this is consistent with the expectations of market participants and with the views of legal academic commentators.[1337]

THINGS INTERNAL AND EXTERNAL TO THE NFT

Information recorded within (or linked to) an NFT

15.18 The more novel and contentious uses of NFTs generally involve situations in which:

(1) NFTs (as crypto-tokens capable of attracting property rights) include an internal dataset as a constituent part of the NFT and/or are linked to an external dataset stored elsewhere; and

(2) control (or, alternatively, "ownership") of an NFT purportedly gives rise to external legal rights in relation to that internal or external dataset.

15.19 Difficult questions can arise in relation to this linked dataset and the nature of any legal rights that attach to such dataset, as opposed to in relation to the crypto-token itself.

15.20 It is perhaps useful to start with an example to illustrate how NFTs can include both an internal dataset as a constituent part of the NFT and a link to an external dataset stored elsewhere.

15.21 Bored Ape Yacht Club ("BAYC") NFTs are NFTs created on Ethereum using the standard ERC 721 contract form.[1338] Each BAYC token is a crypto-token with an individual, numbered ID. Each one is attached to information representing an image of a different cartoon ape, and they are treated by some as collector's items. BAYC NFTs are not generally treated as fungible by market participants.[1339] The crypto-token contract is available to view publicly.[1340] The crypto-token contract gives the crypto-token certain functionality. As discussed in more detail in Chapter 10 and Appendices 3 and 6, this functionality enables the crypto-token to satisfy our criteria of a data object, such that the crypto-token itself can be the object of property rights. However, the crypto-token contract also includes additional information and functions, including information which specifies the "baseURI".[1341] The baseURI is the Uniform

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[1337] See paras 15.6 to 15.7 above.

[1338] See https://etherscan.io/token/0xbc4ca0eda7647a8ab7c2061c2e118a18a936f13d for details on the Bored Ape Yacht Club token and https://boredapeyachtclub.com/#/ for additional details in relation to the NFT and club membership.

[1339] The price of BAYC NFTs varies based on a number of different factors, including the image metadata that is linked to the specific BAYC NFT in question. BAYC NFTs are traded over the counter and on many centralised marketplaces, including OpenSea: https://opensea.io/collection/boredapeyachtclub.

[1340] Available at https://etherscan.io/address/0xbc4ca0eda7647a8ab7c2061c2e118a18a936f13d#readContract.

[1341] For a detailed explanation, see Burnable Labs, "NFT Code Review: Bored Ape Yacht Club": https://burnables.substack.com/p/nft-code-review-bored-ape-yacht-club.

Resource Indicator ("URI")[1342] to which the crypto-token contract points. It stores all the metadata[1343] associated with the individual crypto-tokens tracked by the crypto-token contract. So together, the BAYC NFTs include both an internal dataset as a constituent part of the crypto-token and are linked to an external dataset stored elsewhere.

15.22 For example, the BAYC contract includes a function to identify and locate metadata for each particular BAYC token it records. So:[1344]

(1) The metadata for BAYC token 1[1345] is available at: https://gateway.pinata.cloud/ipfs/QmeSjSinHpPnmXmspMjwiXyN6zS4E9zccariGR3jxcaWtq/1

(2) Within that metadata you can see the associated Bored Ape "image" is listed as: ipfs://QmPbxeGcXhYQQNgsC6a36dDyYUcHgMLnGKnF8pVFmGsvqi

(3) To see the Bored Ape image, you can then navigate to: https://gateway.pinata.cloud/ipfs/QmPbxeGcXhYQQNgsC6a36dDyYUcHgMLnGKnF8pVFmGsvqi.

15.23 In other words, the NFT contains internally recorded information (a specific URI) which points to information recorded externally to the crypto-token system (the Bored Ape image stored on the publicly accessible InterPlanetary File System ("IPFS")).[1346]

15.24 Dr Guadamuz puts the same point another way:[1347]

> It must be stressed that the actual image is not the NFT, and it is not a part of the NFT other than by the presence of a URL that directs to the image.
>
> While the image was used to encode the NFT and make it uniquely attached to the image, the NFT is not the actual image itself, it is the metadata that ties it to the original file. When someone is purchasing an NFT, they are purchasing the metadata file and, as an NFT, this is transferrable as well.

[1342] As we discuss above, a Uniform Resource Identifier ("URI") is a string of characters that uniquely identify a name or a resource on the internet. A URI identifies a resource by name, location or both.

[1343] Metadata is data that describes other data. It is structured reference data that helps to sort and identify attributes of the information it describes. For example, the metadata for a music file might include the artist's name, the album, and the year it was released. See: https://www.ontotext.com/knowledgehub/fundamentals/metadata-fundamental/.

[1344] This process was described in detail in Burnable Labs' substack: "NFT Code Review: Bored Ape Yacht Club", available at: https://burnables.substack.com/p/nft-code-review-bored-ape-yacht-club.

[1345] This token is owned by a co-founder of Yuga Labs and BAYC, Gordon Goner (we use the pseudonym chosen by the co-founder because they have previously expressed a desire to remain pseudonymous): https://twitter.com/GordonGoner?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor.

[1346] The IFPS is a protocol and peer-to-peer network for storing and sharing data in a distributed file system, available at: https://ipfs.io/.

[1347] A Guadamuz, "The Treachery of Images: Non-fungible Tokens and Copyright" (2021) *Journal of Intellectual Property Law and Practice* 1371: https://ssrn.com/abstract=3905452.

Other legal rights linked to an NFT

15.25 The example above refers only to one element of the BAYC NFT — the Bored Ape image data which is associated with an individual BAYC crypto-token. As we discuss above, it is also possible that legal rights in respect of that image data could also be associated with the legal title holder of the particular BAYC crypto-token in different ways.

15.26 NFTs can be seen as useful legal structuring tools, and market participants are likely to combine NFTs and legal rights in multiple different ways. The description below is intended only as an indicative example of how legal rights could purportedly be linked to NFTs. It is not intended as a comment on the legal effectiveness of any such link. Nor do we comment on the purpose, efficacy or value (market, social or otherwise) of market participants choosing to structure their arrangements in this way. We simply observe that it might be possible from a legal perspective. We do not make any proposals for law reform in this regard — indeed, we see the inherent dynamism and flexibility of the law of England and Wales in this area as a good thing.

15.27 The BAYC terms and conditions state that: [1348]

> Each Bored Ape is an NFT on the Ethereum blockchain. When you purchase an NFT, you own the underlying Bored Ape, the Art, completely. Ownership of the NFT is mediated entirely by the Smart Contract and the Ethereum Network: at no point may we seize, freeze, or otherwise modify the ownership of any Bored Ape.

15.28 In these terms and conditions, it is not perfectly clear whether the term "Art" refers to the crypto-token, the internal metadata, the externally linked information or the intellectual property rights in the picture of the Bored Ape itself. However, the term, the framing language in the terms and conditions and the surrounding context imply that the "owner" of an individual BAYC NFT also owns the specific instance of internally recorded information (a specific URI) which points to information recorded externally to the crypto-token system (the publicly accessible Bored Ape image stored on IFPS).

15.29 The original BAYC images [1349] themselves were created by a creative team, including a lead artist. [1350] It is likely that the intellectual property rights associated with the original BAYC images remain subject to an agreement between the artist(s) themselves and the creators of BAYC — Yuga Labs. Similarly, when you buy a physical painting or print you do not usually acquire any intellectual property in it.

15.30 In this consultation paper, we focus on drawing a distinction between a crypto-token as an object of property rights and other things external to a crypto-token that can be linked to that crypto-token. We consider that market participants ought to be able to structure these links as they see fit. So the above is all consistent with our concept of a crypto-token.

[1348] See Terms and Conditions: https://boredapeyachtclub.com/#/terms.

[1349] Presumably these images were either created digitally or on physical media.

[1350] See https://twitter.com/allseeingseneca.

15.31 However, in addition, the BAYC terms and conditions purport to link to two additional legal rights to specific BAYC NFTs:

(1) "a worldwide, royalty-free license to use, copy, and display the purchased Art". This is limited to personal, non-commercial use of the art and for uses in certain market places and third-party websites and applications; and

(2) "an unlimited, worldwide license to use, copy, and display the purchased Art for the purpose of creating derivative works based upon the Art".

15.32 These two licences are clear examples of terms and conditions which purport to link legal rights that are external to a crypto-token system to a specific crypto-token. We discuss this linking crypto-tokens to other rights/obligations in more detail in Chapter 14, above.

15.33 The BAYC terms and conditions do not make any attempt to transfer copyright in the original BAYC artwork created by the artist or artistic team.[1351] They simply grant limited personal and commercial licences to the "owner" of each BAYC NFT to use the specific instance of metadata that the BAYC NFT records. That metadata includes internally recorded information (the specific URI) and information recorded externally to the crypto-token system (the Bored Ape image stored on IFPS that is publicly accessible). So the licence is a licence to use a particular, specified image in limited personal and commercial ways. These particular licences themselves in no way convey or transfer the intellectual property rights (such as copyright) in the original image itself. Again, market-participants have chosen to structure their legal arrangements in this way, using NFTs to achieve their purpose. Different NFTs are likely to use different structures to achieve different purposes.

15.34 Nor does "ownership" of the specific BAYC NFT convey property rights in the information within the internal BAYC dataset or the external BAYC dataset.[1352] The NFT is not the licence — the licence is recorded by terms and conditions external to the crypto-token system. However, the holder of the NFT can prove that they are the holder of the NFT by a combination of evidencing the state of the crypto-token system and their control over the crypto-token itself.[1353] This would act as proof to the owners of the original intellectual property rights that the holder of the specific NFT can undertake the activities for which they hold a licence, in relation to the specific image (itself a copied instance of the original artwork). So, as Dr Guadamuz suggests, "the NFT is evidence of the legitimacy of using the licensed work".[1354]

15.35 Seen in this way, the mechanism for granting a licence over the use of a specified image seems convoluted.[1355] However, the mechanism is also powerful — only the

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[1351] Unless the reference to the "underlying Bored Ape" could somehow be construed as a reference to the underlying copyright in the original artwork.

[1352] As we discuss in Chapter 3, pure information is not an appropriate object of property rights.

[1353] For more detail, particularly in relation to derivative transfers of title, see Chapter 13.

[1354] A Guadamuz, "The Treachery of Images: Non-fungible Tokens and Copyright" (2021) *Journal of Intellectual Property Law and Practice* 1376: https://ssrn.com/abstract=3905452.

[1355] Above.

holder of a specific NFT can prove they have the legal right to use the licensed work in accordance with the terms of the licence.

15.36 A counter-example given by Gabriel Shapiro might help to illustrate the point. The fact that an image of Mickey Mouse is linked to or included in the (internal or external) dataset of an NFT does not in itself confer legal rights. The fact that an NFT is linked to an image of Mickey Mouse could be evidence that the holder of the NFT has infringed Disney's copyright to the Mickey Mouse image. Or it could provide evidence that the holder owns the underlying intellectual property rights (copyright) to the Mickey Mouse image itself or has a licence to that copyright. Which of the three (infringement, ownership of intellectual property rights, or licence) is correct depends entirely on facts external to the crypto-token system, such as the wording of relevant contractual arrangements.[1356]

15.37 We therefore conceptualise an NFT as an individually numbered crypto-token[1357] which contains an internal dataset and/or is linked to an external dataset. That individually numbered crypto-token can also be linked to legal rights (including in relation to the use of the internally or externally linked information) external to the crypto-token system in the ways described in paragraph 15.18 above.

15.38 This conceptualisation clarifies a simple but important point: NFTs that are not linked to external legal rights in some way do not convey any additional legal rights. The NFT token itself can be the object of personal property rights. But, without more, an internal dataset or a linked external dataset does not attract either personal property rights or any other legal rights such as rights under a contractual licence to use or any intellectual property rights such as copyright in an image.

15.39 Gabriel Shapiro re-iterates this point well:[1358]

> So NFTs do not in themselves create or confer "digital ownership" of anything. Ownership is a legal, not technological, concept. All that can be ordinarily presumed when someone lawfully obtains an NFT is that they own that NFT – i.e., they own a token. The fact that the NFT someone owns is linked to metadata, such as an image, carries absolutely no general implication that the NFT holder owns or has a license to that metadata or what that metadata refers to. "The map is not the territory."

15.40 For that reason, many market participants and academic commentators have discussed how there is a "growing misunderstanding when it comes to the ownership of an NFT and what exactly it represents.".[1359] The NFT market has received popular

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[1356] See the original text of the example at G Shapiro, "Legalize NiFTies. Or, How I Learned to Stop Worrying and Love RarePepes" (2020): https://lexnode.substack.com/p/legalize-nifties.

[1357] Which may or may not be "fungible", depending on whether parties are willing to treat those tokens as interchangeable, see para 15.14 above.

[1358] G Shapiro, "Legalize NiFTies. Or, How I Learned to Stop Worrying and Love RarePepes" (2020): https://lexnode.substack.com/p/legalize-nifties and referencing Alfred Korzybski's phrase, see: https://www.lesswrong.com/tag/the-map-is-not-the-territory.

[1359] A Guadamuz, "The Treachery of Images: Non-fungible Tokens and Copyright" (2021) *Journal of Intellectual Property Law and Practice* 1372: https://ssrn.com/abstract=3905452.

press coverage over the last two years. The (sometimes fleetingly) high prices of certain NFTs, the volatility of the NFT marketplace and the name-recognition of artists and collectors involved in the space make NFTs a good subject for news stories. However, many of these reports "seem to assume that what is being sold is the work itself and not a digital representation of the work".[1360]

15.41 The general, high-level understanding of NFTs assumes that all NFTs are alike in the nature and package of rights that they give.[1361] But in practice, NFT licences that grant contractual rights to the holders of tokens vary widely,[1362] and some marketplaces have built into their platforms the option of transferring intellectual property rights, such as copyright with the sale of an NFT by clicking a tick-box.[1363]

15.42 So NFTs are as variable in the rights they provide as any other thing that may be bought. NFTs as crypto-tokens have a reasonably straightforward and simple structure. But NFTs as "cryptoassets" — a crypto-token linked to some thing or rights external to the crypto-token system — are incredibly varied and diverse. We consider that conceptualising NFTs in this way means that the design principles and legal-structuring possibilities for the medium become much clearer. NFTs can become a powerful technological structure that can be used to link to — and to transfer — other legal rights to things external to crypto-token systems. This is not necessarily a problem for the NFT marketplace or for market participants or for the law. Instead, NFTs present an opportunity to iterate an experiment on novel legal structures within the online world.

15.43 As we discuss in more detail in Chapter 14, NFTs (as crypto-tokens) can be linked to many different types of thing external to a crypto-token system in many different ways. And the strength of that link will depend on how it is constituted in the first place. So NFTs can be used to:[1364]

(1) grant a licence to use certain intellectual property (see paragraph 15.48 below);

(2) confer intellectual property rights on the holder of the NFT (see paragraph 15.50 below[1365]);

(3) act as evidence of legal title to a tangible or intangible thing external to the crypto-token system, such as a gold bar, a share security or a debt security (see paragraph 14.19 above); and

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[1360] A Guadamuz, "The Treachery of Images: Non-fungible Tokens and Copyright" (2021) *Journal of Intellectual Property Law and Practice* 1372: https://ssrn.com/abstract=3905452.

[1361] Above, 1372 to 1373.

[1362] J Fairfield, "Tokenized: The Law of Non-Fungible Tokens and Unique Digital Property"(2022) 97 Indiana Law Journal 1261, 1328: https://ssrn.com/abstract=3821102.

[1363] For example, https://mintable.app/. See further: A Guadamuz, "The Treachery of Images: Non-fungible Tokens and Copyright" (2021) *Journal of Intellectual Property Law and Practice* 1367, 1373: https://ssrn.com/abstract=3905452.

[1364] See also G Shapiro's list in "Legalize NiFTies. Or, How I Learned to Stop Worrying and Love RarePepes" (2020): https://lexnode.substack.com/p/legalize-nifties.

[1365] We note that the transfer of intellectual property rights is likely to require certain formalities.

(4) embody intangible rights such that the holder of the NFT can claim performance of the obligations recorded by the NFT (see paragraph 14.62 above).

15.44 We have already discussed the ways in which external things can be linked to a crypto-token. As such, we do not repeat those concepts specifically in the context of NFTs.

15.45 However, much of the focus of market and academic commentary on NFTs has been in relation to issues such as copyright, royalties, licensing and registration systems.[1366] For that reason, we consider those issues briefly below.

Copyright and assignment of copyright

15.46 As we suggest above, the starting point with an NFT is that the NFT itself can attract personal property rights. However, the internal dataset and/or linked external dataset will not attract personal property rights. Moreover, the starting point is that, without more, the internal dataset and/or linked external dataset will not attract any other legal rights such as a licence to use that dataset or intellectual property rights in that dataset such as copyright.

15.47 Many NFTs are not linked to any form of copyright at all. As such, transfers of those NFTs do not involve the transfer of copyright.

15.48 Alternatively, many NFT artists use creative commons licences to make the underlying work open-access, or the Creative Commons CC0 tool[1367] to disclaim copyright ownership of their images and place them in the public domain.[1368] Both the CrypToadz[1369] and NounsDAO[1370] NFT projects use this Creative Commons CC0 tool. This means that anyone can copy, modify, distribute and perform the work, even for commercial purposes, all without asking permission of the original artist. This is the case regardless of whether a person "owns" or holds a particular CrypToadz or NounsDAO NFT.

15.49 In these cases, creators sell their works without relying on copyright at all. The NFT market simply recognises the owner of a "legitimate" NFT of a work as the "owner" or holder of the specific NFT and therefore of the work, even though NFTs typically do not convey copyright ownership. Professor Fyre suggests that in this way, NFT

[1366] See a high-level discussion in B Dale, "Bored Apes' Generous Copyright Approach Besting Stricter CryptoPunks" (2021) *The Defiant*: https://thedefiant.io/bored-apes-yacht-club-cryptopunks-copyright-fight/. For detailed academic commentary, see J Fairfield, "Tokenized: The Law of Non-Fungible Tokens and Unique Digital Property"(2022) 97 *Indiana Law Journal* 1261: https://ssrn.com/abstract=3821102; and A Guadamuz, "The Treachery of Images: Non-fungible Tokens and Copyright" (2021) *Journal of Intellectual Property Law and Practice*: https://ssrn.com/abstract=3905452.

[1367] The CC0 tool allows a creator to "dedicate the work to the public domain by waiving all of his or her rights to the work worldwide under copyright law, including all related and neighbouring rights, to the extent allowed by law", see https://creativecommons.org/publicdomain/zero/1.0/legalcode and https://creativecommons.org/publicdomain/zero/1.0/.

[1368] See B Frye, "Are CryptoPunks Copyrightable?" (2022) *Pepperdine Law Review* (forthcoming), 18: https://ssrn.com/abstract=4029323.

[1369] See https://www.cryptoadz.io/. The home page of the website states that "To the extent possible under law, Gremplin [the artist] has waived all copyright and related or neighboring rights to CrypToadz by Gremplin."

[1370] See https://nouns.wtf/. This refers back to the Creative Commons CC0 tool.

"owners" or holders do not need copyright, because the important "clout" value in holding the NFT "depends on the endorsement of the author, rather than control of the use of the work."[1371]

15.50 However, while many NFTs are not linked to copyright, some are. In these cases, the creator of the NFT will attempt to link copyright in an underlying work to the NFT itself, such that transfer of the NFT will effect a transfer of the copyright to the underlying work. Indeed, Dr Guadamuz notes that:[1372]

> A few platforms are even being built with copyright transfer in mind: Hup Life is an NFT marketplace that builds into their contracts a 'Berne compliant' copyright transfer of rights.

15.51 In these cases, the creators attempt to link the NFT to copyright in the original linked work. The link is intended to operate such that a transfer of the NFT itself effects a transfer of copyright in the original linked work.

15.52 But in the case of transfers of copyright, additional formalities are required. The transfer of copyright must be effected by assignment. Further, under the law of England and Wales, section 90(3) of the UK Copyright Designs and Patents Act 1988 requires that an assignment of copyright is "in writing signed by or on behalf of the assignor". This requirement adds complexity to transfers of copyright that are purportedly effected by a transfer of a linked crypto-token or NFT.[1373]

Licences

15.53 As we discuss from paragraph 15.25 onwards, it is possible to link legal rights that are external to the crypto-token system to a specific NFT.

15.54 With NFTs, this can be done in many ways. For example, the internal dataset and/or linked external dataset of an NFT could include specific licensing terms. Alternatively, the licence could be granted completely separately to the NFT, as in the case of BAYC (see discussion at paragraphs 15.27–15.35 above). It is even possible that a licence to use could be implied by the actions and representations of the creator. For example, a creator might suggest that an NFT represents "ownership" of a particular NFT and that the "owner" is free to use and display the NFT. Those actions and representations could amount to an implied licence to use the particular internal dataset and/or linked external dataset (specifically, the related image) for certain purposes. For example, the implied licence might be a limited licence to use, such as displaying it as a Twitter profile picture or for advertising a sale of the NFT.[1374]

[1371] B Frye, "After Copyright: Pwning NFTs in a Clout Economy" (2021) *Columbia Journal of Law and the Arts*, (forthcoming): https://ssrn.com/abstract=3971240.

[1372] Referring to https://www.hup.life/ and the Berne Convention for the Protection of Literary and Artistic Works 1886. See A Guadamuz, "The Treachery of Images: Non-fungible Tokens and Copyright" (2021) *Journal of Intellectual Property Law and Practice*: https://ssrn.com/abstract=3905452.

[1373] In Chapter 17, we discuss issues relating to other "in writing" formalities requirements separately in the context of dispositions within the meaning of section 53(1)(c) LPA 1925.

[1374] See B Frye, "Are CryptoPunks Copyrightable?" (2022) 19, for a discussion on this point in the context of V1 CryptoPunks: https://ssrn.com/abstract=4029323.

15.55 Nevertheless, while there are arguments that an implied licence to use could arise in certain cases, the conservative starting point should be that an NFT does not confer a licence automatically.[1375]

15.56 We expect that, over time, the way in which legal rights that are external to the crypto-token system are linked to a specific NFT will evolve with market practice. One example is the "Rarible NFT Licence", which is a template licence for NFT projects that specifically envisions that the licence is "included in the NFT's metadata (in full or through an IPFS or other web link)" and contains detailed licensing terms.[1376] That licence includes a personal, non-commercial use licence which is granted to the "Collector".[1377] Importantly, the licence also includes a non-assignment clause which prevents assignment of the licence without an accompanying transfer of the NFT:

> The Collector's rights, title and interest in the Collectible may not be assigned, sold or transferred, in whole or in part, to any person and the Resale Right may not be exercised, in whole or in part, without a sale and transfer of the NFT associated with the Collectible to the assignee, purchaser or transferee, as applicable.

15.57 As discussed at paragraph 14.76 above, this non-assignment clause is an important method to help strengthen the link between the NFT and the external legal rights (here, the licence). Without this clause, the "negative" element of the link between the NFT and the licence would not be satisfied, because the licence would be capable of transfer without a corresponding transfer of the NFT.

15.58 Currently, "art" based NFTs (that is, NFTs linked to information which represents some artistic work) make up a large part of the NFT market, and so licensing terms have been a principal focus for the market. As we have discussed, we consider that linking a licence to an NFT is possible and, depending on the terms of the licence, can be effective. However, linking a licence to an NFT is just one example of a legal right that can be linked to an NFT. We anticipate that legal engineering innovations in this respect will continue, and will expand the type, extent, and complexity of legal rights that are linked crypto-tokens.

Royalties

15.59 One powerful legal structuring tool for NFTs is that it is possible to design the NFT contract such that the original creator receives an immediate payment for their work,

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[1375] See A Guadamuz, "The Treachery of Images: Non-fungible Tokens and Copyright" (2021) *Journal of Intellectual Property Law and Practice* 1367, 1372: https://ssrn.com/abstract=3905452.

[1376] The Rarible NFT licences were originally written by Gabriel Shapiro and Stuart Smolen with the support and collaboration of Rarible and are licensed under a Creative Commons Attribution-ShareAlike 4.0 International License, see https://github.com/rarible/nft-license.

[1377] See clause 3. The "Collector" is defined as "the person who lawfully holds exclusive title to and ownership of the NFT included in such Collectible, for so long as such person continues to hold such title to and ownership of such NFT." The "Collectible" is defined as "the combination of: (A) an Ethereum-based NFT having a Uniform Resource Identifier ("URI") identifying an appropriately configured JSON file conforming to the ERC-721 Metadata JSON Schema, ERC-1155 Metadata URI JSON Schema or a similar JSON schema, as applicable (such JSON file, the "Collectible ID"); and (B) the Collectible Metadata specified by such Collectible ID."

usually on mint or transfer.[1378] Often, the NFT contract will be structured so that such a payment is also made on each subsequent transfer between third parties. Sometimes this structure is referred to as a "royalties" structure.[1379] The design of the NFT contract, therefore, allows creators to build in a commission, or royalty structure, meaning they can receive passive revenue from their work if it continues to be traded on the secondary market.[1380]

15.60 The benefits of this legal structuring tool to creators are self-evident. As Dr Guadamuz argues:

> It is not difficult to see how this system is appealing to authors as it guarantees future earnings in a manner that the law cannot. Furthermore, when we consider that for the most part the author would also retain full copyright even after selling the NFT, this benefits them considerably. Contrast this with the existing resale right in the UK as implemented by the Artist Resale Rights Regulations 2006,[1381] which is very limited in scope and application.

15.61 Given that the NFT market remains in its infancy, we expect that further innovation from creators, developers, legal engineers and lawyers will help to explore the various possible uses of the technology. This could significantly alter how creators interact with digital rights management in future.

REGISTRATION OR RECORDS

15.62 We consider that, as crypto-tokens, NFTs could be used in record-keeping or registration systems in the way described at paragraph 14.19 above. The simple choice of technical token standard or specification (for example, choosing a "fungible" or "non-fungible" token standard) ought not prevent a token being used in this way. In fact, NFTs might be even more useful for this task than "fungible" tokens, given that the specific NFT ID is associated with a given address at any one time.

15.63 Again, we consider that the issues described in Chapter 14 in relation to registration systems that use crypto-tokens/crypto-token systems would be equally applicable in the context of NFTs.

15.64 But in the context of NFTs, there might be some additional concerns that would need to be addressed when using an NFT-based register system. For example, it may be possible for coders seemingly to replicate an NFT, even to the extent that the NFT was created such that it looks like it came from a particular address. This process is what is known as "sleepminting": a third-party can mint a work without authorisation

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[1378] Even though, as discussed above, what is being sold is simply the crypto-token, which will contain an internal dataset, which may be linked to an external dataset and which may or may not be linked to external legal rights.

[1379] See A Guadamuz, "The Treachery of Images: Non-fungible Tokens and Copyright" (2021) *Journal of Intellectual Property Law and Practice* 1367, 1372: https://ssrn.com/abstract=3905452.

[1380] See, for example, Superrare: "For primary sales, there is an 15% commission (creators receive 85%). For secondary sales, creators receive a 10% commission (aka royalty)": https://superrare.com/about.

[1381] This was expanded to the full duration of copyright in the Artist's Resale Right (Amendment) Regulations 2011.

and make it appear as if the NFT came from a particular creator.[1382] An example of this occurring in practice was "Monsieur Personne" who successfully minted a replica of Beeple's "The First 5000 Days".[1383] While the NFT token ID of the "sleepminted" The First 5000 Days NFT was different to the token ID of the first The First 5000 Days NFT, the "sleepminted" NFT was created such that the creator was shown as being the wallet controlled by Beeple.

15.65 In such a situation, the first NFT and the "sleepminted" NFT would remain distinguishable, so "sleepminting" should not prevent the use of NFTs within a record or register system.

15.66 Another potential concern is the problem of forking blockchains. Where one blockchain forks into two, there would need to be some determinant to decide the NFT that was considered to be the "authoritative" record.[1384] Sophisticated legal terms and conditions relating to NFTs will provide for this possibility. For example, the Rarible NFT licence includes the following term relating to a hard-fork of Ethereum (referred to as an "Ethereum Persistent Fork"):

> In the event of an Ethereum Persistent Fork creating copies of the Collectibles at the same addresses at which they were then held on Ethereum, the scope of the term "Collector," and all licenses granted to and other rights of a Collector under these Terms, shall be deemed expanded to include each person who lawfully holds exclusive title to and ownership of the copies of such NFTs that are included on the Ethereum Persistent Fork.

15.67 In this event, the Rarible Terms and Conditions explicitly recognise that a hard fork could lead to:

> The aggregate number of the Collectibles [being] increased, which could have an adverse effect on the value of each Collectible or the aggregate value of the total Collectibles.

15.68 These issues are idiosyncratic to crypto-token systems and so will need to be specifically considered by parties who choose to use crypto-token systems in the ways described in this chapter.

MYRIAD NFTS

15.69 Because of the myriad NFTs and their varied implementation and sets of linked rights, this chapter only presents an overview of some interesting and recent examples.

15.70 The principal purpose of the chapter is to help market participants distinguish between the NFT as a crypto-token, and the NFT as a "cryptoasset" — a crypto-token linked to

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[1382] See A Guadamuz, "The Treachery of Images: Non-fungible Tokens and Copyright" (2021) *Journal of Intellectual Property Law and Practice* 1372: https://ssrn.com/abstract=3905452.

[1383] See Kilroy, The $69 Million NFT Art Thief, Nifty News (2021) at https://www.niftynftnews.com/blog/nft-heist and K Low, "The Emperor's New Art: Cryptomania, Art & Property" (2021) 17.

[1384] For further discussions on forking, see K Low and E Teo, "Bitcoins and other cryptocurrencies as property?" *Law, Innovation and Technology* (2017) 235, 262 to 263 and M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) ch 8.

some thing or rights external to the crypto-token system.[1385] We consider that this is a helpful starting point from which to analyse NFT implementations. It also will help to preserve the inherent flexibility of the NFT medium as a legal structuring tool.

15.71 This distinction and inherent flexibility is summarised by Professor Allen and others:[1386]

> Consider five NFTs created on the ERC-721 token standard:[1387]
>
> (1) One is an in-game object that can be "worn" by a player's avatar and traded across game-worlds.[1388]
>
> (2) One represents a piece of graphic art but purports to give its holder no intellectual property or other rights in the artwork.[1389]
>
> (3) Another represents a fraction of an apartment in a condominium and purports to "fractionalise" ownership of the condominium between the holders of the token.[1390]
>
> (4) One represents a seat in a sports club stadium and purports to entitle the token holder to occupy the seat for a certain time.[1391]
>
> (5) One represents a bottle of wine which does not yet exist (the wine is undifferentiated in a barrel) but will be numbered, linked to the token, and stored pending pick-up.[1392]

15.72 As we discuss in this chapter, and as Professor Allen and others note, each of these NFTs is constituted using the same underlying crypto-token implementation — the ERC-721 token standard.[1393] They are therefore very similar in that way. However, the legal treatment of each NFT, when considered as a constituent whole together with the thing or rights external to the crypto-token system to which it is linked might be very different.

15.73 This nuance, flexibility, and latitude in terms of legal structuring make the NFT marketplace a highly innovate and iterative area. We consider that the private law of England and Wales is well-suited to facilitate this. Additionally, while we recognise the

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[1385] See Chapter 10 paras 10.3 to 10.5 for more detail on this distinction.

[1386] J G Allen, H Wells, M Mauer and M Bacina, "Cryptoassets in the Courts: Emerging Trends and Open Questions in Private Law from the First 10 Years" (forthcoming 2022).

[1387] See https://ethereum.org/en/developers/docs/standards/tokens/erc-721/.

[1388] For example, https://www.forbes.com/sites/justinbirnbaum/2022/01/06/why-video-game-makers-see-huge-potential-in-blockchain-and-why-problems-loom-for-their-new-nfts/?sh=4df5445543d7.

[1389] See eg https://www.theatlantic.com/ideas/archive/2021/04/nfts-werent-supposed-end-like/618488/.

[1390] See eg http://www.fraction.co/.

[1391] See eg https://dso.co/.

[1392] https://www.penfolds.com/en-au/about-penfolds/collaborations/blockbar.html.

[1393] J G Allen, H Wells, M Mauer and M Bacina, "Cryptoassets in the Courts: Emerging Trends and Open Questions in Private Law from the First 10 Years" (forthcoming 2022).

difference between "fungible" and "non-fungible" token standards,[1394] we do not consider that NFTs create novel legal issues that are distinct from crypto-tokens more broadly. We would be interested in consultees' views on this.

Consultation Question 28.

15.74 Do you consider that there are any specific legal issues relating to non-fungible tokens ("NFTs") that would require different treatment from other crypto-tokens under the law of England and Wales?

[1394] See also our discussions in Chapters 12 and 13 paras 12.47 to 12.59 and 13.81 to 13.83.

Chapter 16: Custody of crypto-tokens

INTRODUCTION

16.1 Owners of crypto-tokens routinely deploy their objects of property rights — their crypto-tokens — in facilities and arrangements in which they relinquish a degree of direct control over access. This might be for a variety of purposes, including improved security over their holdings; access to specific trading markets; lower cost and/or more efficient transaction execution and settlement systems; yield- or revenue-generating opportunities; and access to different token functionalities.

16.2 In addition, some crypto-tokens derive their market value or functionality from other "linked" crypto-tokens that are subject to (and may be "locked" or "encumbered" within) certain facilities and/or arrangements. In many cases, their owners do not have direct control over the "locking" or "encumbering" facilities or arrangements, which are often administered, provided and/or controlled by other persons.

16.3 Crypto-token markets and market participants frequently use the term custody to describe a number of different kinds of facility, arrangement or relationship. We consider the circumstances in which these facilities, arrangements or relationships properly can constitute, or be structured as, custody relationships and the different legal consequences of those arrangements as a matter of current law. In this respect, we emphasise that the term custody simply denotes a factual arrangement, and that factual arrangement will not necessarily give rise to a uniform set of legal (or regulatory) consequences.

16.4

16.5 In Chapter 17, we go on to discuss discrete areas of law reform that relate specifically to custody arrangements in respect of crypto-tokens. Both this chapter and Chapter 17 refer to, and use examples of, custody arrangements in respect of crypto-tokens rather than data objects more generally. This is because crypto-tokens are the principal type of data object for which such custody arrangements have developed in the market. However, we consider that the analysis contained in this chapter is likely to be applicable to data objects more broadly (to the extent that they use the same or similar underlying technology as crypto-tokens).

Structure of this chapter

16.6 We begin by defining the core features and categories of factual custody relationships, and consider a range of crypto-token–specific holding structures to which these categories could apply.

16.7 We then outline the different options for recognising or building a legal foundation for what we describe as "direct" custody arrangements in respect of crypto-tokens under the law of England and Wales. We note that such custody arrangements can be based on either contract or trust, and compare the rights and responsibilities for participants and providers arising under each. However, this chapter does not suggest

that specific law reform is required to achieve effective custody relationships and the desired legal consequences of those specific arrangements.

16.8 Finally, we consider, but provisionally conclude against, law reform amounting to a presumption that crypto-token direct custody arrangements take effect as trusts in the absence of clear evidence to the contrary, as a default rule of interpretation.

LEGAL CUSTODY AND CRYPTO-TOKEN CUSTODY SERVICE CATEGORIES

16.9 In *Ruscoe v Cryptopia*, Justice Gendall defined the duties of a custodian of property belonging to another. These generally include "securing, safeguarding and maintaining the property in the condition received and accounting for any changes in it".[1395]

16.10 In relation to crypto-tokens specifically, a custodian can be characterised as a person holding crypto-tokens on behalf of, or for the account of other persons.[1396] In this context, "holding" refers to a custodian having the capacity to exercise, or to coordinate or direct, the exercise of "factual control", as described in Chapter 11.[1397] "Holding", therefore, encompasses arrangements where the custodian has the capacity to exercise factual control entirely by itself, or where factual control is exercised in a practical sense through, or in collaboration with, one or more third parties. This would include where a custodian has appointed and delegated the performance (in whole or in part) of the custody services to a sub-custodian.

16.11 Our conception of "holding" and its relationship with "factual control" draws upon, and aligns with, the "holding" concept developed by the UNIDROIT Digital Assets and Private Law Working Group ("the UNIDROIT Working Group") in connection with its proposed custody principles for digital assets.[1398]

1395 [2020] NZHC 728 at [173].

1396 H Liu, L Gullifer and H Chong, "Client-intermediary relations in the crypto-asset world" (2020) *University of Cambridge Faculty of Law Research Paper No 18/2021*, 2 to 3. See also KPMG "Cracking Cryptoasset Custody" (2020), 3 to 4.

1397 See Chapter 11, in which we propose the development and application of a new concept of "factual control" in relation to data objects.

1398 UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* Principle 12 s (2)(b), and in relation to the appointment of sub-custodians, Principle 15: https://www.unidroit.org/wp-content/uploads/2022/03/W.G.5.-Doc.-3-Master-Copy-Principles-plus-Comments-with-Questions.pdf).

However, one important point of difference is that the UNIDROIT Working Group's custody principle only applies to crypto-token holding arrangements under which the relevant crypto-tokens would "not [be] available to the creditors of the custodian if the custodian enters into any insolvency proceeding". Under the current law of England and Wales, this would restrict the principle to trust-based custody arrangements under which users retain an equitable proprietary entitlement to assets held on their behalf by a custodian acting as trustee in priority to the claims of the custodian's general creditors. In contrast, and as explained below, we extend our definition to arrangements where users retain only unsecured contractual claims to the delivery of crypto-tokens held on their behalf by a custodian. In the context of this consultation paper, we think this definitional approach is more helpful to market participants. It enables us to provide a more complete overview of the different legal frameworks available to service providers when structuring facilities for holding crypto-tokens on behalf of others under the private law of England and Wales (either on a standalone basis or when offered together with a broader set of bundled services). We then build on this

16.12 Based on this definition, the degree of control that the custodian has (or has the capacity to coordinate or direct) over crypto-tokens that it holds can be understood as comprising two dimensions:

(1) positive control, which involves the factual ability to use, dispose of or transfer an asset; and

(2) negative control, which involves the factual ability to exclude others from using the asset.

16.13 However, not all providers of services relating to the safekeeping of crypto-tokens necessarily constitute, nor do they hold themselves out as being, custodians as defined above, or at all. And the crypto-token markets and market participants often use the term custody in a colloquial sense to describe both the type of custodial relationship described above and/or "custodial/custody-like" services where a custodial relationship (as described above) may not exist. Therefore, we recognise that projects and businesses that engage in activities involving the control of crypto-tokens which are received or transmitted from, or held in connection with transactions undertaken by, other persons can be sub-divided in three general categories:[1399]

(1) direct custodians (that is, the type of custodial arrangement described above);

(2) custodial (and other) technology services providers; and

(3) hybrid service providers.

16.14 We explain each in turn. As we expand on below, irrespective of how a service provider chooses to label its activities, we consider that only those properly described as direct custodians — as opposed to technology services providers — will be subject to the custody-related legal obligations described in this chapter.

Direct custodians

16.15 Direct custodians are persons or organisations that engage in activities that clearly satisfy the definition of custody above. That is, they hold crypto-tokens on behalf of or for the account of other persons and have the capacity to exercise or to coordinate or direct the exercise of factual control in terms of both its positive and negative aspects.

Custodial (and other) technology services providers

16.16 This category includes persons or organisations that provide software and/or hardware devices for owners of crypto-tokens to undertake self-custody more securely. They do not have positive control (which is retained by the owner) but can potentially exercise negative control over the crypto-tokens (accidentally and/or deliberately).

16.17 For example, the provider of a desktop wallet application facilitates the local retention and use by the owner of the private keys necessary to authenticate an operation

overview in the subsequent parts of this chapter to set out a direct comparison between the rights and risks associated with the different frameworks from the perspectives of both custodial service providers and their users.

[1399] THE BLOCK Research, "Institutional Custody for Digital Assets: A Primer" (2021) pp 26 to 29.

(including a transaction) in respect of the particular crypto-tokens associated with the corresponding public key. It does not itself have access to those private keys. However, a bug in the software (whether introduced inadvertently or intentionally) could result in the owner losing access to those private keys. This would effectively amount to a manifestation of negative control by the developer. Nevertheless, in such a scenario, the technology service provider would still not have positive control and could not, therefore, be characterised as a direct custodian.

16.18 On the other hand, certain organisations may represent themselves as merely technology providers rather than custodians, despite being able to exercise, or direct or coordinate, both positive and negative control over crypto-tokens. Such organisations often state that they exercise such control in any substantive legal sense on behalf of, or for the account of, others. These organisations do not recognise, and may expressly disclaim, a legal duty to any other person in connection with how they hold and use crypto-tokens under their control. Whether such arrangements are in fact direct custody arrangements, notwithstanding any disclaimers to the contrary, is likely to be a matter of construction of the particular legal relationships in question.

Hybrid service providers

16.19 These include organisations that operate both direct custody facilities and, separately, "custodial/custody-like" technology services facilities.

16.20 This category includes organisations that provide specialist "multi-signature" services, where crypto-tokens are held at addresses that require multiple private keys or multiple parts of a single private key to authenticate an operation (including a transaction) in respect of those crypto-tokens.[1400] The distribution of private keys or key parts is divided between the owner and service provider, thereby creating a shared custody arrangement. The hybrid service provider is, therefore, not unilaterally capable of exercising positive control over the relevant crypto-tokens. However, depending on the particular multi-signature arrangement implemented, and the circumstances, it could assert negative control over them (for example, by losing access to, or refusing to use, its allocated private key(s)). Again, whether such arrangements are in fact (or involve) direct custody arrangements, notwithstanding any disclaimers to the contrary, is likely to be a matter of construction of the particular legal relationships in question.

CORE FEATURES OF COMMON PLATFORMS INCORPORATING CRYPTO-TOKEN CUSTODY SERVICES

16.21 Although crypto-token markets continue to evolve and innovate, certain operating models for facilities and arrangements that provide (or that could be characterised as providing) crypto-token custody services have become reasonably well established. These models routinely incorporate a set of core features that have become widely adopted across the industry. In the following section, we outline some of the principal

[1400] Multi-signature arrangements are also referred to as M-of-N arrangements, with M being the required number of signatures or keys to authenticate an operation and N being the total number of signatures or keys involved in the arrangement.

elements of these facilities, before examining how and to what extent they could be supported by different legal frameworks under the law of England and Wales.

Intermediary custodians and custodial exchanges

16.22 Currently, crypto-token market participants rely extensively on storing and trading crypto-tokens indirectly through accounts maintained at intermediary custodians and custodial exchanges. Users of these intermediary platforms are then able to retain, buy, sell, lend, stake, and use as collateral entitlements to crypto-tokens that are recorded as book entry credits in the relevant intermediary's internal ledger. These types of arrangement will generally constitute direct custody arrangements.

16.23 The book entries can be understood or characterised as representing claims for the delivery of crypto-tokens by the intermediary to the platform user. Intermediaries will often undertake to retain control of a quantity of crypto-token entitlements in connection with, and to settle, potential user claims.[1401] The intermediary's entitlements may comprise of crypto-tokens to which it has full legal title, which it controls (in positive and negative senses) directly, and which are recorded on the networks in which the relevant underlying crypto-token balances are instantiated. Alternatively, the intermediary might be one of a number linked together in a chain of intermediaries. In those circumstances, the intermediary's entitlements may comprise of indirect rights to crypto-tokens, through accounts held with, and claim(s) based on, book entries in the internal ledgers of one or more higher-tier intermediaries.

16.24 In terms of current market practice, intermediary custodians will commonly use a single network address to hold — on a collective basis — the crypto-token entitlements related to a number of users at the same time.[1402] Alternatively, where the custodian delegates the provision of custody services to a sub-custodian, the intermediary will commonly rely on a single higher-tier intermediary account. Some may use such addresses or accounts to hold entitlements that the custodian retains for its own use and benefit.[1403] Where the entitlements comprise of, or relate to, crypto-tokens which are fungible, they are typically retained or recorded as pooled, consolidated balances. In these circumstances, there are not normally any specific, segregated allocations in those higher-tier accounts or network addresses that can be

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[1401] Whether users' claims are merely personal contractual rights enforceable against their immediate custodian or whether they include or constitute proprietary rights to any entitlements held by that custodian on behalf of its users will depend on the proper legal characterisation of the relevant custody arrangement. See from para 16.42 below.

[1402] This is the standard custody model in operation today. However, some custodians do offer, as a premium service, segregation of entitlements at individual, client-specific, network addresses. In general, the purpose of such offerings is both to provide clients with heightened protection to custodial insolvency risk, and to facilitate intermediated access to decentralised finance ("DeFi") protocols.

[1403] See for example, the User Agreement for the Coinbase Custodial Exchange, at s.5.19(D): https://www.coinbase.com/legal/user_agreement/payments_europe. See also the Terms of Use for the Liquid Custodial Exchange (Effective Date: 11 October 2021), at section 9.2: https://help.liquid.com/en/articles/5608835-liquid-terms-of-use.

linked to the claims of individual users.[1404] In this context we use "fungible"[1405] to mean the following:

(1) crypto-tokens that are not intended to be uniquely identifiable; are intended for use as fully interchangeable notional units of equal value and validity in the settlement of transactions; and are divisible into, and capable of transfer as, fractional non-whole units (such as bitcoin or ether); or

(2) crypto-tokens from series that are often sold and referred to by market participants as non-fungible tokens ("NFTs") due to their being indivisible and capable of transfer in non-fractional whole-unit quantities only, but which are individually indistinguishable from other tokens in the same series.[1406]

16.25 There are benefits to indirect holding arrangements. First, market participants can gain exposure to, use, and manage holdings in crypto-tokens without being subject to the capacity limits and fees associated with holdings and transactions undertaken directly on networks in which such crypto-tokens are instantiated. Second, responsibility for technically complex and operationally burdensome security maintenance requirements is delegated to service providers with specialist expertise and extensive resources.

16.26 Custodial exchanges often combine indirect holding arrangements with collective holdings of underlying crypto-token entitlements in connection with the claims of multiple users. Doing so allows trades between these users to be effected purely by a change in the custodial exchange's internal ledger entries, while balances recorded to the underlying higher-tier account or network address remain unaltered. This can make trading quicker, cheaper, and more convenient, particularly for certain types of high-frequency strategies relating to crypto-tokens constrained by low transaction capacity and/or high fees for on-chain trades.

16.27 This accounting model can be used to execute and settle trades in both fungible and non-fungible crypto-tokens, provided that the accounts of both transferor and

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[1404] See M Yates and G Montague, *The Law of Global Custody* (4th Edition 2013) para 3.24. In the context of custody structures for intermediates securities, the authors refer to this type of custody arrangement as "fungible custody". In the context of crypto-token custody and custodial trading platforms, see for example, the Terms of Service for the OKEX custodial exchange (updated 18 June 2021), in which users are required to "…expressly agree to the pooling of your [crypto-token entitlements] with the [crypto-token entitlements] of other Users. Individual User entitlements may not be identifiable by separate physical documents of title or other electronic record…": https://www.okex.com/support/hc/en-us/articles/360021813691-Terms-of-Service.

[1405] We discuss the concept of fungibility in more detail in Chapter 15 at para 15.9.

[1406] For examples of the latter category, see the "Snoop's Stash Box" token series: https://opensea.io/assets/0xc36cf0cfcb5d905b8b513860db0cfe63f6cf9f5c/23989906867926161674167909823939658907648 0, created on the Ethereum network under the ERC-1155 token standard and intended to represent exclusive access to certain music-related content and for possible use in connection with certain metaverse computer games. See also the "Pearce X4" token series: https://solscan.io/token/2iMhgB4pbdKvwJHVyitpvX5z1NBNypFonUgaSAt9dtDt, created on the Solana network under the SPL token standard for use (in part) in connection with the Star Atlas metaverse computer game. For further information about ERC-1155 tokens see https://docs.openzeppelin.com/contracts/3.x/erc1155 and https://moralis.io/erc1155-exploring-the-erc-1155-token-standard/, and in relation to SPL tokens see https://moralis.io/how-to-create-a-solana-token-in-5-steps/.

transferee are linked to the same collective network address or higher-tier account. However, it is important to note that, to enjoy these benefits, users have to give up direct access to the private keys controlling the addresses at which the crypto-tokens that ultimately underlie their internal account balances are held.[1407] Not all users will want to make this compromise.

16.28 Crypto-token custodians and custodial exchanges are clear examples of direct custodians. They exercise positive and negative control over, and undertake sole responsibility for the management of, private keys[1408] necessary to authenticate an operation (including a transaction) in respect of certain crypto-token holdings, on behalf of, or for the account of, their users.

"Lock and mint" facilities

16.29 Although not normally characterised as constituting direct custody arrangements (or custodial technology services) platforms, "lock and mint" facilities involve relinquishing control over one form of crypto-token (the "locked" token), and the related receipt of control of a different form of crypto-token, which is the "minted" token.[1409] The minted token may be (but is not necessarily) capable of being transferred between network addresses. The process may also be reversible. It may be possible to relinquish control of minted tokens, effecting a release and receipt, or reacquisition of control, of previously locked tokens.

16.30 "Lock and mint" facilities can be used in a wide range of applications, such as crypto-token "bridges" and wrapping protocols, or fractional ownership token issuance platforms. We explain these below.[1410]

Bridges and wrapping protocols

16.31 Token bridges and wrapping protocols are platforms designed for network interoperability. They enable crypto-tokens (or more accurately, the value and identity associated with particular crypto-tokens) to be "transferred" between, or relocated to, different networks, or different levels or layers of the same network. Through the bridging or wrapping process, crypto-token holders can access functionalities; applications; cost reductions and other trading efficiencies; transacting capacity; and

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[1407] *Ruscoe v Cryptopia Limited (in liquidation)* [2020] NZHC 728 at [22]. UNIDROIT (International Institute for the Unification of Private Law) Digital Assets & Private Law Working Group, "Revised Issues Paper" (November 2021) pp 30 to 31. K Low, "Trusts of Cryptoassets" (2021) *Trust Law International and Trusts and Private Wealth Management: Developments and Directions*; *City University of Hong Kong School of Law Legal Studies Research Paper No. 2020-020* pp 14 to 15.

[1408] Although the custodian undertakes sole responsibility for private key management as between itself and its account holder, in practice this function may be mediated through its own accounts at one or more higher-tier intermediaries.

[1409] Note that we use the term lock and mint broadly, to describe in accessible and consistent language the technical encumbrances and corresponding creation of new tokens that characterise such facilities or arrangements. This is not a term of art within the crypto-token and cryptoasset markets, which generally use more precise and technical terms to refer to the specific features or functionality of the facilities or arrangements in question.

[1410] We note, however, that there is no consistent market practice as to how such "lock and mint" facilities are structured, either from a technological or legal perspective, and the description below is therefore high-level only.

access to markets that are otherwise inaccessible or of more limited availability on the "native" underlying source network, level, or layer.

16.32 There are many different designs of bridges and wrappers currently in operation, but a feature common to all of them is the "locking" or "freezing" of a quantity of crypto-tokens. A user will typically transfer a quantity of tokens to be bridged or wrapped (either directly or through a third-party intermediary) to an address or smart contract that is not controlled by the transferor (thus "locking" or "freezing" the tokens). Afterwards, a corresponding quantity of a new set of tokens is created (or "minted") on the destination network, layer, or level. The newly minted tokens ultimately will be accessible and controllable by the transferor. The minted tokens are, in general, intended to be identified and used within the destination system as a representation of, and having a value corresponding to,[1411] the bridged or wrapped crypto-token. The term bridge is, therefore, potentially somewhat misleading since token bridges do not involve the actual transfer of specific crypto-tokens — as objects of property rights — between systems at all. Instead, they provide a mechanism for the transmission of the identity and value associated with crypto-tokens between systems.

16.33 The bridging or wrapping process can, in general, be reversed.[1412] This involves removing the minted crypto-tokens on the destination system from the available circulating supply, or "burning" them. Burning can be achieved by sending the minted tokens (either directly or through a third-party intermediary) to an address without any, or any knowable, private key. This renders them unspendable. Following this process, a quantity of crypto-tokens corresponding to the quantity previously locked will be released to, or rendered controllable by, the ultimate initiator of the minted token burn.[1413]

NFT fractionalisation platforms

16.34 NFT fractionalisation platforms use "lock and mint" facilities to generate tradeable tokens that are distinct from the "locked" NFT. Those distinct tokens are intended to represent, or function as, a percentage ownership interest in, or a percentage entitlement to, the realisable value of a locked NFT or basket of NFTs.

16.35 They can be used for liquidity purposes. Fractionalisation of the token can give a broader range and higher number of market participants a comparatively affordable

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[1411] Although not necessarily on a 1:1 basis, and the value of the new tokens compared with the value of the "locked" or "frozen" tokens might fluctuate depending on a variety of factors.

[1412] An example of an exception would be a bridge used to facilitate a token "upgrade", which requires users to irreversibly transfer control of the "old" tokens to the bridge. In exchange for those tokens, they will receive control of new "upgraded" tokens. Since the "old" tokens are burned or otherwise rendered irretrievable, there is no need — nor is there any expectation — for them to be safeguarded on behalf of users that might in the future wish to recover them. Consequently, one-way, irreversible bridges do not have the potential to raise custody issues, unlike reversible bridges that rely on users retaining the capacity to retrieve locked tokens.

[1413] For an introduction to token bridges see https://blog.makerdao.com/what-are-blockchain-bridges-and-why-are-they-important-for-defi/. For further in-depth analysis on wrapped crypto-token protocols see G Caldarelli, "Wrapping Trust for Interoperability: A Preliminary Study of Wrapped Tokens" (2022) 13(1) *Information* 6. For an example of a specific bridging protocol, see the description of bridging crypto-tokens between Ethereum and Arbitrum at https://developer.offchainlabs.com/docs/bridging_assets#depositing-and-withdrawing-ether.

opportunity to gain partial exposure to highly-valued crypto-tokens (such as NFTs from prominent collections). Fractionalisation can also provide owners of these highly-valued assets, for which there is typically relatively limited demand, an effective way of accessing more liquid markets for exiting, or reducing their exposure to, a particular investment. Fractionalised tokens minted in connection with locked NFTs are structured in different ways.[1414]

16.36 Whether and how any "lock and mint" facility should be categorised as a form of, or incorporating, a crypto-token direct custody arrangement depends on how it has been structured and how it can be controlled (both operationally and by reference to the intentions of the parties involved). For example, the locked crypto-tokens could be under the discretionary positive and negative control of a centralised intermediary that exercises its control powers on behalf, or for the account, of other persons. This would likely be categorised as a direct custody relationship.

16.37 In contrast, if control of the locked crypto-tokens is automated through decentralised smart contracts, it is likely that no direct custody relationship would arise. The developers, operators or validators of the smart contracts would be categorised as technology service providers only. However, smart-contract–based locking facilities could involve a direct custody relationship if they can be centrally manipulated. An example would be where the developers have "emergency" centralised controls to suspend the operation or implement an "upgrade"[1415] of the smart contracts. Depending on the configuration of these controls, they could potentially be used to assert both negative and positive control of crypto-tokens that are "locked" or "frozen".[1416] If the retention of negative and positive control is undertaken for the benefit of the account of users, then the developers or other controlling parties could be categorised as direct custodians.

16.38 However, we consider that developers would only be at risk of being categorised, and of owing legal obligations, as direct custodians if they were genuinely capable of exercising discretionary negative and positive control of crypto-tokens in a real and immediate sense. The risk would be minimal for developers that merely comprise an unidentified, shifting class of persons without any formal organisational structure and whose ability to exert positive and negative control was remote and essentially hypothetical.

[1414] See for example the Fractional Art platform: https://fractional.art/. Fractional describes the tokens created in connection with crypto-tokens immobilised through their platform as representing "tokenised fractional ownership": https://medium.com/fractional-art/what-is-fractional-dd4f86e6458a. However, other platforms such as Fusible, refer to minted token issuances as representing, not fractional ownership interests in, but fractional value entitlements to a locked crypto-token: https://fusible.medium.com/the-nft-market-needs-democratisation-with-fractionalisation-d2b8f28abb16.

[1415] See https://cryptomarketpool.com/multiple-ways-to-upgrade-a-solidity-smart-contract/, and the comments on the potential "de facto" mutability of smart contracts contained in the discussion on "Decentralized Autonomous Organizations" in V Buterin, "Ethereum Whitepaper" (2014, updated 2022): https://ethereum.org/en/whitepaper/#decentralized-autonomous-organizations.

[1416] This is a feature of multiple current and recent bridge development projects. See the FAQs and Project-specific risk assessments for various Ethereum L2 bridges at https://l2beat.com/faq/#are-there-any-other-ways-l2-validators-can-steal-user-s-coins, and https://l2beat.com/?view=risk.

16.39 In making this point, we draw an analogy with the conclusions of Mrs Justice Falk in *Tulip Trading v Van Der Laan & Ors*.[1417] In that case, it was alleged that owners of bitcoin had entrusted the care of their assets to the core developers of the software on which the Bitcoin network operated, who it was alleged exercised "complete power over the system" through which such assets were held.[1418] However, the court rejected the claim that these developers thereby owed fiduciary and tortious duties to all owners of bitcoin that would render them legally obligated to develop and issue software updates to facilitate the recovery of any bitcoin to which owners had lost access. In concluding that the claims for breach of fiduciary duty and tort had no realistic prospect of success, Mrs Justice Falk commented that:[1419]

> I do not think that bitcoin owners can realistically be described as entrusting their property to a fluctuating, and unidentified, body of developers of the software, at least in the sense and to the extent claimed by [the claimant].

16.40 This case suggests that developers, in these circumstances, cannot be regarded as having been entrusted with objects of property rights for the purpose of establishing fiduciary obligations and tortious liability. It would seem to us equally untenable for them to be regarded as being so entrusted for the purpose of establishing a direct custody relationship.

Consultation Question 29.

16.41 We provisionally conclude that it is appropriate to draw a distinction between direct custody services (that is, holding crypto-tokens on behalf of or for the account of other persons and having capacity to exercise or to coordinate or direct the exercise of factual control in terms of both its positive and negative aspects) and custodial or other technology-based services that do not involve a direct custody relationship. Do you agree?

LEGAL FRAMEWORKS FOR CRYPTO-TOKEN CUSTODY ARRANGEMENTS

Contract-based outright title transfer/title retention — direct custody

16.42 One option for the legal basis of a direct custody facility over crypto-tokens is an outright transfer, or full retention of title, arrangement. This is where the custodian acquires full title to any crypto-token, or crypto-token entitlements, transferred or transmitted to it by a user. The custodian will also retain full title to any crypto-tokens, or crypto-token entitlements, that the custodian acknowledges as being held or acquired for the account of a user.

16.43 A custody facility will be recognised as taking effect in this way where that would be consistent with the intention of the parties. As a matter of law, this determination will be made by construing the terms of the contract that governs the operation and

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[1417] [2022] EWHC 667 (Ch).

[1418] Above at [65].

[1419] Above at [73].

provision of the arrangement. Such a determination is also likely to require that the relevant transfer formalities (if any) have been complied with.[1420]

16.44 Adopting an outright transfer or full retention model for a custody facility can be commercially and operationally appealing to custodians. It provides them with a substantial degree of flexibility in, and control over, how custodied assets and entitlements are managed and over the scope and substance of any associated legal liabilities. Users retain no proprietary entitlement or encumbrance over any specific (or any specific pools of) assets and entitlements. Instead, the users will simply have, at best, a personal claim for the value of the assets, as discussed below. Consequently, those users will have no mechanism, as a matter of general property law, to constrain how, or for what purposes, a custodian deals with the assets, nor to require their return or delivery.[1421] This legal state of affairs is captured by the popular phrase "not your keys, not your coins",[1422] which is intended to help new or inexperienced users conceptualise the distinction between self-custody of their coins and a direct custody arrangement. However, as we discuss in more detail at paragraphs 16.52 to 16.53 below, this phrase does not accurately capture the flexibility or legal nuances of direct custody arrangements, particularly those structured as trusts, with regard to the consequences of an insolvency of a direct custodian.

16.45 Although parties can, in principle, contractually agree that the custodian will only use the assets in particular ways or for particular purposes, any breach of these undertakings will ordinarily only give rise to a claim for compensatory damages, enforceable against the custodian personally.[1423] The same is true of contractual rights to the return or delivery of custodied assets and entitlements. They will not ordinarily grant users any proprietary right of recourse to any specific property held by the custodian, even when agreed in connection with non-fungible crypto-tokens. Furthermore, contractual obligations for the return or delivery of fungible crypto-tokens or crypto-token entitlements will typically be expressed as being capable of settlement by a transfer or transmission of equivalent property. So, the obligation will not necessarily require the settlement or re-transfer of the exact same objects as may have originally been transferred by the user to the custodian.[1424]

16.46 In practice, the outright transfer or full retention model is typically adopted with the specific aim of giving the custodian broad rights to use custodied tokens and entitlements for its own commercial purposes. The terms of any related contract will

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[1420] H Liu, L Gullifer and H Chong, "Client-intermediary relations in the crypto-asset world" (2020) *University of Cambridge Faculty of Law Research Paper No 18/2021*, 3.

[1421] In Chapter 19 we discuss the availability and applicability of different actions and remedies to arrangements involving crypto-tokens under the law of England and Wales.

[1422] Itself a derivative of Andreas Antonopoulos' "If you control the bitcoin keys, it's your bitcoin. If you don't control the bitcoin keys, it's not your bitcoin": A Antonopoulos, *The Internet of Money, Volume One* (2016) p 18.

[1423] Any dealing constraints would also have to be drafted carefully to avoid or minimise the risk of the arrangement being inadvertently recharacterised as a trust-based facility. See the analysis of trust-based crypto-token custody arrangements below from para 16.52

[1424] Expressing return or delivery rights in terms of *equivalent* assets does not preclude, and is not necessarily inconsistent with, a user retaining a proprietary claim to specific assets or pools of assets held by the custodian. See the analysis of trust-based crypto-token custody arrangements below from para 16.52.

routinely support and elaborate, rather than place extensive limitations on, these rights. The custodian will therefore have the benefit of wide discretionary powers to deploy these tokens and entitlements for various revenue-generating activities, such as sales or loans to third parties. The custodian enters into such transactions as principal and not as agent for the relevant user(s). Additionally, the custodian could use the tokens and entitlements for direct or indirect[1425] participation in transaction and block validation activities to support the operation of Proof of Stake consensus-based crypto-token networks.[1426] There are no general common law principles that would prevent the custodian from retaining for its own benefit any portion — or indeed all — of the revenue generated by such activities. Nevertheless, in many cases custodians elect or agree to pass on a portion of such revenue to users, as direct distributions or credits to their custody accounts, or indirectly, through a reduction in service fees.

16.47 The benefits to users of the outright transfer or title retention custody models are, therefore, lower fees and potentially better access to yield- or revenue-generating opportunities. However, the trade-off is increased unsecured exposure risk in a custodian insolvency. On the insolvency of a custodian, users would be unsecured creditors. Their claims to the return or delivery of crypto-tokens[1427] would rank as unsecured claims only with no proprietary claim to any specific crypto-tokens.[1428] Users would therefore face the likelihood of much greater losses when compared to other, perhaps less economically appealing, custody models under which they could have retained proprietary rights in, and protected priority claims to, specific (or specific pools of) assets held by the insolvent custodian.[1429]

16.48 As contractual arrangements, the rights and obligations of the parties to an outright transfer or title retention custody facility will be determined fundamentally by the terms of the agreement(s) on which the facility is based. These terms can be expressly set

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[1425] That is, intermediated, possibly pooled.

[1426] For a detailed description of Proof of Stake, see Ethereum, "Proof-of-Stake (POS)", https://ethereum.org/en/developers/docs/consensus-mechanisms/pos/.

[1427] Or crypto-token entitlements credited to their custody account balances, or represented by, or linked to, tokens they hold.

[1428] Although such users would not have a proprietary interest in the crypto-tokens, they would retain a contractual claim for the return of crypto-tokens as objects of property rights — claims to the delivery of property. However, these claims would be of a personal, unsecured contractual nature only, so if they were disclaimed by an insolvency practitioner they would ultimately be converted into unsecured unliquidated damages claims (which are monetary in nature). See also our discussions in Chapter 19 at para 19.19 and, in particular para 19.20, where we consider whether such "monetary" awards could be denominated in crypto-tokens.

[1429] *Quoine Pte Ltd v B2C2 Ltd* [2020] SGCA(I) 02, [148]. The agreement governing user access to the custodial crypto-token exchange operated by Quoine Pte Ltd contained express disclosures regarding the risk of losses to users if the exchange entered insolvency proceedings. The Singapore Court of Appeal, relying in part on these disclosures, concluded that crypto-tokens held by the exchange in connection with user accounts were not held on trust. The absence of similar insolvency-related risk disclosures in the terms of use for the Cryptopia custodial exchange was used by the New Zealand High Court to distinguish *Quoine* and support it reaching the opposite conclusion as to the existence of trusts over commingled, unallocated pools of crypto-tokens for the benefit of users: *Ruscoe v Cryptopia Limited (in liquidation)* [2020] NZHC 728 at [165](c)). See also N Lister, M Kimber, "Bitcoin: exposure or exposed? Risks relating to cryptocurrency exchange insolvency" [2018] *Journal of International Banking and Financial Law* 538.

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out in the relevant contractual documentation, or can arise by implication, both under the common law, where necessary to give business efficacy to the contract, and under applicable statutes. An example of the former implied term (if not already provided for in an express term) would be an obligation not deliberately or negligently to lose control of, or access to, the tokens held in custody. An example of the latter statutory implied term (if not already provided for in an express term) would be an obligation on any custodian performing a service to perform that service with reasonable care and skill.[1430]

16.49 The law of England and Wales allows contracting parties extensive autonomy in agreeing terms that exclude or limit liability for breach (or for what would otherwise be a breach in the absence of such exclusion or limitation clauses). These terms will be broadly effective in a commercial context between parties to negotiated business contracts. For such agreements, in practice, liability for losses caused unintentionally, even by negligent acts or omissions, can be avoided by a custodian,[1431] although losses from fraud cannot.[1432] When contracting on a custodian's standard terms of business, any term seeking to exclude or restrict the custodian's liability for breach of contract will be subject to a test of "reasonableness".[1433] When contracting with, or giving notice of access conditions to, an individual who qualifies as a "consumer",[1434] more extensive limitations apply. These limitations cover not only exclusion and limitation clauses,[1435] but also extend to any unfair terms that cause "a significant imbalance in the parties rights and obligations under the contract to the detriment of the consumer".[1436]

Contractual and personal non-contractual duties — custodial (and other) technology services

16.50 As an alternative to an outright transfer or full retention of title arrangement, the parties may enter a technology services contract, under which the technology services provider nevertheless acquires positive or negative control of the crypto-tokens. In such a situation, the provider may exclude, or structure the arrangement so as to avoid, any obligation to exercise that control on behalf of, or for the account of, any other persons, thereby avoiding being characterised as a direct custodian. Contracts

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1430 Supply of Goods and Services Act 1982, s 13.

1431 Terms purporting to exclude or restrict liability for negligence are subject to a requirement of reasonableness: Unfair Contract Terms Act 1977, ss 2(2) and 11. It is not possible to exclude or restrict liability for death or personal injury resulting from negligence: Unfair Contract Terms Act 1977, s 2(1).

1432 As a matter of public policy: *HIH Casualty & General Insurance Ltd v Chase Manhattan Bank* [2003] UKHL 6, 1 All ER (Comm) 349 at [15] to [16], referring to *Lazarus Estates Ltd v Beasley* [1956] 1 QB 702 at 712 by Denning LJ and *Weir v Bell* (1878) 3 Exch D 238 at 245 by Bramwell LJ.

In relation to trustees, see Armitage v Nurse [1998] Ch 241 at 250–256; and L Tucker, N Le Poidevin, J Brightwell, *Lewin on Trusts* (20th ed 2020) para 41-132.

1433 Unfair Contract Terms Act 1977, ss 3 and 11.

1434 Consumer Rights Act 2015, s 2(3) defines a consumer as "an individual acting for purposes that are wholly or mainly outside that individual's trade, business, craft or profession."

1435 See, for example, in relation to services contracts, Consumer Rights Act 2015, s 57, which renders a range of specified exclusion and limitation clauses ineffective, including in relation to any that purport to apply to the trader's statutory obligation to perform a service with reasonable care and skill.

1436 Consumer Rights Act 2015, s 62(4).

will also form the basis of relationships with technology services providers that do not acquire or retain exclusive[1437] positive and negative control of crypto-tokens.

16.51 As with outright transfer/title retention agreements, the rights and obligations of parties to technology services contracts will be governed by the terms expressly agreed, as well as potential implied terms and other limits as outlined above. Depending on the circumstances, tort-based duties of care and other non-contractual duties may also arise.[1438]

Trust-based arrangements — direct custody

16.52 As discussed above, contract-based outright transfer/title retention direct custody arrangements can, in principle, be commercially attractive to users as well as custodians. However, they come with risks for users, most notably exposure to substantial losses where a custodian enters insolvency proceedings and where users rank as unsecured creditors.

16.53 The law of England and Wales allows for an alternative legal framework, based on the trust, to structure direct crypto-token custody arrangements. Under this type of arrangement, although the custodian has positive and negative control in respect of the crypto-tokens, the custodian holds them on trust for the benefit of the user. Although not as versatile as contractual arrangements, a trust-based structure can provide users with effective protection against custodian insolvency risk. This is because, unlike in a contract-based framework, the user will retain a proprietary right in the objects of property held on trust. In this case, the user has the equitable beneficial interest in the crypto-tokens or the crypto-token entitlements held by the custodian, rather than full legal and equitable title in the crypto-tokens or the crypto-token entitlements themselves. The existence of such proprietary rights safeguards the value of user claims in the event of their custodian's insolvency, because the relevant crypto-token entitlements would be ring-fenced for their benefit in priority to the claims of the custodian's general unsecured creditors.

16.54 This is also possible with a valid trust-based intermediary custody facility, provided that the "three certainties" for establishing a trust are satisfied (as set out below). In those circumstances, a user's book-entry entitlement would be structured and characterised as an equitable interest under a trust (or a series of sub-trusts) of a quantity of crypto-tokens instantiated on the underlying network. The crypto-tokens themselves would be held and controlled by an intermediary acting as trustee (or

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[1437] Contracts would also therefore, form the basis of hybrid services involving shared custody through the operation of "multi-signature" accounts and the distribution of the necessary private keys between owner (and nominees of the owner) and service provider: H Liu, L Gullifer and H Chong, "Client-intermediary relations in the crypto-asset world" (2020) *University of Cambridge Faculty of Law Research Paper No 18/2021* p 9.

[1438] We note that in *Tulip Trading v Van Der Laan & Ors* [2022] EWHC 667 (Ch), Falk J at [98] stated that she could see how "it might be arguable that, when making software changes, developers assume some level of responsibility to ensure that they take reasonable care not to harm the interests of users, for example by introducing a malicious software bug or doing something else that compromised the security of" the relevant crypto-token network. Furthermore, in relation to a network or platform where developers did exercise "complete power", Falk J regarded it as "conceivable that some duty might be imposed to address bugs or other defects that arise in the course of operation of the system and which threaten that operation". See also Chapter 19 at para 19.55.

through a chain of intermediaries acting as trustees).[1439] Again, the user would have a beneficial interest in the tokens or token entitlements held by the intermediary.

16.55 Not all equitable beneficial entitlements to crypto-tokens are represented by book-entries in the internal account ledgers of intermediaries. Equitable entitlements could instead be represented by tokens themselves and transferred without the active involvement of the custodian through regular on-chain transactions.[1440] Such an "on chain" direct custody facility could treat a particular set of "minted" crypto-tokens as representing equitable interests in other "locked" crypto-tokens.[1441] The trust would rely on the distributed ledger or structured record in which the tokens were recorded as a register of equitable interests.[1442] The trustee could use the relevant network as a mechanism for managing the distribution of benefits to and the retention, use and transfer of such equitable interests.[1443]

Establishing a valid trust — satisfying the "three certainties"

16.56 A trust does not necessarily need to be set up by a trust deed. It can be created informally, including by an oral declaration in respect of property other than land.[1444] However, for a particular arrangement, including a direct custody arrangement over crypto-tokens, to be effective as a trust it needs to satisfy the "three certainties" necessary to create a trust under the general law.[1445] In the context with which we are concerned, this requires the following:[1446]

(1) a clear intention by the relevant party or parties for the custodian to hold its title to specified crypto-token entitlements on trust for one or more beneficiaries (and resulting in the grant of equitable property claims in such entitlements to those beneficiaries);

[1439] M Solinas, "Bitcoins in Wonderland: Lessons from the Cheshire Cat" [2019] 3 *Lloyd's Maritime and Commercial Law Quarterly* 433, 448 to 449.

[1440] See also Chapter 14 para 14.68.

[1441] For the use of crypto-tokens as a register of (legal or equitable) interests and linking entitlements to and dispositions of intangible rights to holdings and transfers of crypto-tokens, see Chapter 14.

[1442] For an example of using crypto-tokens as a register of equitable interests under a trust (albeit a Cayman Islands purpose trust established in accordance with the Cayman Islands Special Trust (Alternative Regime) Law 1997) see the Wassie NFT-linked trust: "The NFT-linked trust" (2022), https://cryptoconsigliere.substack.com/p/the-nft-linked-trust?utm_source=url&s=r.

[1443] In addition to arrangements incorporating crypto-tokens custody facilities, crypto-tokens could also be used to represent equitable interests in (or incorporate equitable secured claims to) specified property or funds comprised of real world physical assets, such as physical gold bars, or things in action such as debt claims. Legal frameworks for the tokenisation of physical assets and things in action, including via a trust structure, are considered in more detail in Chapter 14.

[1444] J McGhee, S Elliott, S Bridge, M Conaglen, P Davies, *Snell's Equity* (34th ed 2019) paras 21-018 to 21-021, 22-035, 24-001. For formalities requirements in respect of trusts concerning land, see the Law of Property Act 1925, s 53(1)(b).

[1445] These "three certainties", which are certainty of intention, subject matter and object, were first set out in *Knight v Knight* (1840) 49 ER 58.

[1446] H Liu, L Gullifer and H Chong, "Client-intermediary relations in the crypto-asset world" (2020) *University of Cambridge Faculty of Law Research Paper No 18/2021* p 4.

(2) sufficient identification of the beneficiaries that are the objects of the trust; and

(3) sufficient identification of the crypto-token entitlements constituting the property interests that will be the subject matter of the trust.

Certainty of intention

16.57 To meet this requirement, there would need to be sufficient evidence for a court to be able to identify, based on an objective assessment, an intention on the part of the relevant party or parties to establish a trust. The court would look to determine the substance of any intention and not merely to the labels used to describe an arrangement. Where an agreement or relationship between the parties includes references to trusts, the court may regard this as persuasive but not conclusive in determining whether the requisite intention has been established. Conversely, an absence of any references to trusts in any agreement or in the context of the relationship does not preclude the existence of a trust. Even a lack of awareness and understanding of the nature of trusts by the parties involved does not necessarily preclude the courts from recognising that one or more have been validly established.[1447] However, it is important to note that in a business context, the courts will be reluctant to "impose" a trust on unwitting parties where purely personal, non-proprietary, rights would be sufficient to achieve their commercial objective.[1448]

16.58 Recent case law provides some indications of the operational structures and trading business models in which trusts over crypto-tokens held by intermediary custodians may be established. For example, in *Ruscoe v Cryptopia*,[1449] the New Zealand High Court recognised the existence of a series of trusts over crypto-tokens held in connection with customer trading accounts (and to a limited extent the custodian's own trading activity) at the Cryptopia custodial crypto-token exchange. The court was satisfied that the necessary certainty of intention was established by a combination of:[1450]

(1) The structure and content of the internal database maintained by Cryptopia to track client account balances.

(2) The content of Cryptopia's internal financial accounts and its Goods and Services Tax returns. The documents demonstrated that Cryptopia did not assert any ownership in the crypto-tokens held in connection with the operation of its custodian exchange, apart from the beneficial interest that supported the limited trading activity it undertook on the platform in a principal capacity.

(3) Cryptopia's conduct in establishing the crypto-token exchange "without allocating to account holders public and private keys for the [crypto-tokens] it…[held] for them".

[1447] *Ruscoe v Cryptopia Limited (in liquidation)* [2020] NZHC 728 at [156](b).

[1448] *Pearson, Lomas & ors v Lehman Brothers Finance SA & ors* [2010] EWHC 2914 (Ch) at [225]. In the crypto-token context, see *Wang v Darby* [2021] EWHC 3054 (Comm) at [52] to [53]. M Yates, G Montague, *The Law of Global Custody* (4th ed 2013) para 3.48.

[1449] *Ruscoe v Cryptopia Limited (in liquidation)* [2020] NZHC 728.

[1450] Above at [153] to [155], [165].

(4) The fact that Cryptopia did not intend to, and in fact never did, use the crypto-tokens held on behalf of and in support of its customers' trading balances to engage in trading for its own principal benefit.

16.59 The court reached its conclusion and held that certain of the trusts recognised came into existence despite there being at the relevant time no express reference to trusts in the terms and conditions governing customer access to, and trading on, the Cryptopia exchange.

16.60 The New Zealand High Court, in *Ruscoe v Cryptopia*, distinguished the decision of the Singapore Court of Appeal in *Quoine Pte Ltd v B2C2 Ltd*.[1451] In that decision, the existence of a trust in connection with customer account balances held at a custodial crypto-token exchange was not recognised, reversing a previous contrary finding by the Singapore High Court in the same case. The New Zealand High Court noted that in the context of its own custodial exchange, Quoine both offered and directly engaged in a broader range of trading activities than were supported by Cryptopia. In particular, Quoine was the principal market maker for, and also engaged in, futures trading on its exchange. Additionally, it offered its customers the opportunity to act as market makers themselves and to participate in leveraged margin trading. As a result, the crypto-tokens held by Quoine did not necessarily match the balances represented by these activities at all times, with Quoine purchasing additional crypto-tokens if required to address any shortfalls and settle customer claims as and when they arose.

16.61 Furthermore, the New Zealand High Court highlighted operational differences between the Cryptopia and Quoine trading platforms. It noted, with respect to the latter, the lack of crypto-tokens actually segregated in sufficient quantities to support customer account balances. The terms and conditions governing use of the Quoine trading platform also included risk disclosures which expressly warned customers of the substantial losses they could be exposed to in the event of Quoine entering insolvency proceedings. The Singapore Court of Appeal observed that these appeared to contradict the suggestion that there was an intention to create a trust.[1452]

16.62 Drawing, to a degree, on the approaches adopted in the above cases, we anticipate that the courts in this jurisdiction would likely take a purpose-based and commercially responsive approach to identifying and giving effect to an intention to establish trusts by crypto-token custodians. Ultimately, the private law of England and Wales can provide a flexible and versatile framework for structuring crypto-token custody platforms incorporating multiple business lines. Where, for example, intermediary custodians and custodial exchanges offer users crypto-token safeguarding services alongside a range of trading and yield-generation services, trusts could be deployed in a targeted manner with predictable outcomes. Equitable property entitlements for the benefit of users would only arise in connection with those services for which they were

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[1451] [2020] SGCA(I) 02 at [149]; *Ruscoe v Cryptopia Limited (in liquidation)* [2020] NZHC 728 at [165].

[1452] *Quoine Pte Ltd v B2C2 Ltd* [2020] SGCA(I) 02 at [148]; *Ruscoe v Cryptopia Limited (in liquidation)* [2020] NZHC 728 at [162].

appropriate, with others being managed on the basis solely of personal (non-proprietary) rights and remedies instead.[1453]

16.63 Similarly, trusts can be used when crypto-tokens are intended to represent property claims to other crypto-tokens held in direct custody by a custodian.[1454] We think that this can potentially be an effective structure for the creation of fractional entitlements to NFTs or for centralised bridging and wrapping protocols. It could address the concerns of those (actual and potential) token holders that require the value and integrity of their tokenised entitlements to be protected from the risk of substantial losses if the custodian holding the underlying associated crypto-tokens enters an insolvency process.

Certainty of objects

16.64 For crypto-token custodians we do not anticipate that the requirement for object certainty will raise any practical issues for structuring book-entries or crypto-token issuances as equitable interests in crypto-tokens or crypto-token entitlements under a trust. With respect to book entry claims, beneficiaries and their individual interests should be adequately identifiable from the accounting records maintained by relevant intermediaries in connection with their internal ledgers. For tokenised claims, the certainty provided by the distributed ledgers, structured records or registers maintained by the smart contracts or crypto-token networks through or in which such tokenised entitlements are instantiated will be sufficient for the establishment of a trust.

16.65 This will remain the case even if the set of beneficiaries is subject to changes over time, or if the account ledger or register is maintained on a pseudonymous basis or otherwise does not comprehensively identify all the persons holding beneficial entitlements. Such issues are merely instances of evidential uncertainty and are of themselves insufficient to prevent the recognition of a trust where that would be consistent with the intentions of the relevant parties involved.[1455]

Certainty of subject-matter

16.66 For a valid trust to be established, the property that is the subject matter of the trust for each beneficiary must be clearly identifiable. However, determining how and whether this "certainty of subject matter" test can be satisfied in connection with intangible assets held in omnibus accounts for multiple users is not entirely straightforward. This is due to the possible relevance of the "allocation principle", or "the law's insistence that proprietary rights cannot be acquired in fungibles forming an unidentified part of a bulk until they have been separated by some suitable act of

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[1453] See also the discussion on exercising rights of use or rehypothecation over crypto-tokens and crypto-token entitlements in Chapter 18. *Första AP-Fonden v Bank of New York Mellon SA/NV & Ors* [2013] EWHC 3127 (Comm) at [173] to [174].

[1454] Discussed above from para 16.22.

[1455] *Ruscoe v Cryptopia Limited (in liquidation)* [2020] NZHC 728 at [148] to [150], [157]; H Liu, L Gullifer and H Chong, "Client-intermediary relations in the crypto-asset world" (2020) *University of Cambridge Faculty of Law Research Paper No 18/2021* p 4.

appropriation".[1456] This principle applies both to legal and equitable property claims, to absolute transfers and the grant of security interests.[1457]

16.67 The allocation principle is potentially problematic for users of crypto-token custodians and custodial exchanges. Under these types of arrangements, crypto-token entitlements are typically held in connection with users' claims at network addresses or higher-tier accounts on a collective, commingled basis, without any identifiable allocation or segregation in relation to the claims of individual users.[1458]

16.68 For users of these platforms, it is of real practical importance to be able to assert proprietary rights as trust beneficiaries to crypto-token entitlements retained by a custodian on their behalf, or in connection with their account balances. This is particularly important in the event of an insolvency process as discussed above. We discuss two possible approaches to allocation of assets in omnibus accounts:

(1) the equitable co-ownership approach; and

(2) the "intangible assets exception" approach.

The equitable co-ownership approach

16.69 The law governing the declaration of trusts over commingled, unallocated intangible assets has in recent years been the subject of extensive academic commentary and a number of court decisions. Much of that academic commentary and judicial reasoning was in the context of holdings of intangible assets such as shares and other securities, discussed in our paper on intermediated securities.[1459] The relevant case law is not entirely clear and is open to differing interpretations. However, we think that under the law of England and Wales, the current position with regard to omnibus accounts of intermediated crypto-tokens would be as follows.

(1) A valid trust can be established by characterising the claims of users represented by internal account balances for a particular crypto-token as constituting beneficial co-ownership rights. The co-ownership rights would be held by users as equitable tenants in common.[1460] They would constitute proportional entitlements to the entire, undivided quantity of that crypto-token entitlement retained at, and identifiable by reference to, specified network addresses or higher-tier intermediary accounts by the custodian on trust for those users.

[1456] R Goode, "Ownership and Obligation in Commercial Transactions" (1987) 103 *Law Quarterly Review* 433, 436. See also M Yates, G Montague, *The Law of Global Custody* (4th ed 2013) para 3.27; V Dixon, "The Legal Nature of Intermediated Securities: An Insurmountable Obstacle to Legal Certainty?" in L Gullifer, J Payne, *Intermediation and Beyond* (2019) p 64.

[1457] L Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th Edition 2017) para 6-15; M Yates and G Montague, *The Law of Global Custody* (4th ed 2013) para 3.27.

[1458] THE BLOCK Research, "Institutional Custody for Digital Assets – A Primer" (2021) p 13.

[1459] *Intermediated securities: who owns your shares? A scoping paper* (November 2020), https://www.lawcom.gov.uk/project/intermediated-securities/.

[1460] G Cooper, "Virtual property as trust assets and investments" [2021] *Journal of International Banking and Financial Law* 751, 752

(2) Beneficial co-ownership rights under a trust are capable of applying to consolidated balances of crypto-tokens that can properly be regarded as fungible. These are asset balances that can be broken down into distinct items of property, which are indistinguishable from each other and are capable of being treated as fully interchangeable units of equal value and validity in the settlement of transactions. In addition, beneficial co-ownership rights can apply to crypto-tokens where the entire token set should more properly be regarded as an undistinguishable and inseparable single asset, such as a tokenised class of company shares or a tokenised debt issuance.[1461] A custodian's internal ledger entries representing fractional entitlements to one indivisible NFT held by it on behalf of, and to facilitate trading among, its account holders can also be characterised and structured as beneficial co-ownership interests under an equitable tenancy in common.

(3) It will likely be more straightforward for the courts to recognise equitable co-ownership rights to collective, unallocated crypto-token entitlements, when they are held on behalf of, or in connection with, user claims only, and are separate and segregated from "house" entitlements that the custodian holds for its own benefit.[1462] However, it is important to note that operational segregation by itself is not necessarily sufficient to establish a trust if it cannot be objectively demonstrated that this would be consistent with the intentions of the parties involved.[1463] On the other hand, commingling of user and house claims to the same unallocated crypto-token entitlement can still be consistent with a grant of equitable co-ownership rights to users. In such a scenario, there would need to be clear evidence that the custodian holds the entitlement on trust for itself and the users of its platform.[1464]

(4) Setting out the terms (or alternatively, expressly denying the existence) of any equitable co-ownership arrangement in any written services contract between custodians with their platform users would help to provide clarity and certainty as to the respective rights and obligations of the parties involved. Even in the absence of any express contractual references to a trust, a court may still recognise the existence of a trust where this would be consistent with the objectively ascertained intentions of the parties. However, in a business or commercial context, a trust will not be implied where personal, non-proprietary rights between the contracting parties would alone be sufficient to achieve their commercial objective.[1465]

16.70 Where there are no express contractual provisions providing for an equitable co-ownership, the analysis set out above could be regarded as being somewhat artificial,

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[1461] R Goode, "Are Intangible Assets Fungible?" 3 *Lloyd's Maritime and Commercial Law Quarterly* 379, 388. L Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th ed 2017) para 6-15.

[1462] See M Yates and G Montague, *The Law of Global Custody* (4th ed 2013) para 3.42.

[1463] *Quoine Pte Ltd v B2C2 Ltd* [2020] SGCA(I) 02 at [145].

[1464] *Pearson, Lomas & ors v Lehman Brothers Finance SA & ors* [2010] EWHC 2914 (Ch) at [233] and the explanation therein of *Hunter v Moss* [1994] 1 WLR 452. In the crypto-token context, see *Wang v Darby* [2021] EWHC 3054 (Comm) at [88]. See also *White v Shortall* [2006] NSW SC 1379.

[1465] *Pearson, Lomas & ors v Lehman Brothers Finance SA & ors* [2010] EWHC 2914 (Ch) at [233]; *Wang v Darby* [2021] EWHC 3054 (Comm) at [88].

particularly in relation to fungible crypto-tokens. In such circumstances, it is perhaps better understood as more of a pragmatic solution to a technical rule of trust law imposed by the courts than as a conclusion based on identifying the specific intentions of the parties.[1466]

16.71 Nevertheless, the co-ownership approach has received support from academic commentators.[1467] It has also been endorsed by the courts in England and Wales. In *Pearson, Lomas v Lehman Brothers Finance SA*,[1468] the High Court considered in part whether and on what basis a valid trust could be granted over intermediated securities held unallocated in commingled "omnibus" accounts in connection with the claims of multiple parties. Mr Justice Briggs (as he then was) noted that *Hunter v Moss*[1469] had established that there was "no objection on the grounds of uncertainty to a trust of part of a shareholding of the trustee". The explanation for this conclusion that he found "most persuasive" was that such a trust worked:[1470]

> by creating a beneficial co-ownership share in the identified fund, rather than in the conceptually much more difficult notion of seeking to identify a particular part of that fund which the beneficiary owns outright.

The "intangible asset exception" approach

16.72 Alternatively, trusts over collective unallocated holdings of intangible assets can be supported by other legal arguments that are based on applying different subject matter certainty rules depending on whether the assets in question are tangible or intangible. For example, it is possible to interpret the decision in *Hunter v Moss*[1471] as establishing that property rights can arise in an unidentified part of a specified quantity or bulk of assets that are intangible where such assets are necessarily indistinguishable from each other. The argument is that the complete interchangeability of these types of assets renders the allocation principle unnecessary and inapplicable to achieve subject matter certainty. Any of the assets can be used whenever required in connection with, and identified at the relevant time to determine, the proper execution of the trust.[1472]

1466 V Dixon, "The Legal Nature of Intermediated Securities: An Insurmountable Obstacle to Legal Certainty?" in L Gullifer, J Payne, *Intermediation and Beyond* (2019) p 66.

1467 M Yates and G Montague, *The Law of Global Custody* (4th ed 2013) para 3.47; R Goode, "Are Intangible Assets Fungible?" 3 *Lloyd's Maritime and Commercial Law Quarterly* 379; G Richardson "Lehman Brothers: Traditional Trust Principles and 21st Century International Bank Failures" (2011) 17 *Trusts and Trustees* 226.

1468 *Pearson, Lomas & ors v Lehman Brothers Finance SA & ors* [2010] EWHC 2914 (Ch).

1469 [1993] 1 WLR 934.

1470 [2010] EWHC 2914 (Ch) at [231] to [232], citing with approval the analysis of Campbell J in *White v Shortall* [2006] NSW SC 1379 at [212].

1471 [1993] 1 WLR 934.

1472 *Hunter v Moss* [1993] 1 WLR 934 at 946. V Dixon, "The Legal Nature of Intermediated Securities: An Insurmountable Obstacle to Legal Certainty?" in L Gullifer and J Payne, *Intermediation and Beyond* (2019) pp 64 to 65. M Solinas, "Bitcoins in Wonderland: Lessons from the Cheshire Cat" [2019] *3 Lloyd's Maritime and Commercial Law Quarterly* 433 at 448 to 449. L Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th ed 2017) para 6-15; M Yates and G Montague, *The Law of Global Custody* (4th ed 2013) para 3.38.

16.73 These arguments have been accepted and followed in subsequent court decisions concerning trusts over unallocated shares.[1473] Similar reasoning has also been applied to crypto-token custody arrangements. In *Ruscoe v Cryptopia*,[1474] the New Zealand High Court had to consider whether valid trusts could be granted over unallocated holdings of crypto-tokens. The crypto-tokens were held by a custodial exchange on behalf of certain sets of its trading customers collectively and commingled with balances held in connection with the exchange's own house positions too.[1475] Justice Gendall concluded that there was sufficient subject matter certainty for the existence of valid trusts over the pooled crypto-token holdings, based on the clarity and detail of the exchange's internal accounting ledger. Justice Gendall dismissed the relevance of the allocation principle, distinguishing the decision in *Re Goldcorp Exchange Limited (in receivership)*[1476] on the grounds that it was a sale of goods[1477] case involving tangible property.[1478] The particular conceptual approach taken in these two cases of excluding the application of the allocation principle to intangible indistinguishable fungible assets has been criticised as being problematic in principle and reliant on arbitrary distinctions that are difficult to justify.[1479]

Conclusions on certainty of subject-matter

16.74 We recognise that a degree of uncertainty remains as to the correct conceptual basis for satisfying the certainty of subject matter requirement for a trust over commingled, unallocated intangible assets. However, we consider that it should be practically possible for a crypto-token custody arrangement involving crypto-token entitlements held on an unallocated basis at specified network addresses or higher-tier intermediary accounts to be characterised as a trust under the law of England and Wales.[1480] Structures consistent with, and expressed as, a grant of co-ownership rights under an equitable tenancy in common should be upheld by the courts, and given effect to, according to their terms. As such, our provisional conclusion is that no law reform (particularly any statutory reform) is required to clarify the legal position in relation to subject matter certainty requirements for creating a valid trust over

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1473 *Re Harvard Securities Ltd (In Liquidation)* [1998] BCC 567 (1997) at 576 to 557, at which Neuberger J (as he then was) appeared to apply this interpretation of *Hunter v Moss*, following the decision of the Court of Appeal ([1994] 1 WLR 452) in that case as binding precedent. At the same time, Neuberger J acknowledged the force of the argument that there was "no sound reasoning for distinguishing trusts of goods from trusts of intangibles" when determining the relevance of the allocation principle to valid declarations of trust, and that treating shares differently to chattels in this context was a distinction he was "not particularly convinced by".

1474 [2020] NZHC 728.

1475 *Ruscoe v Cryptopia Limited (in liquidation)* [2020] NZHC 728 at [22], [137](b), [146].

1476 [1995] 1 AC 74, in which a trust over unallocated gold bullion was rejected due to a lack of subject matter certainty.

1477 New Zealand Sale of Goods Act 1908.

1478 *Ruscoe v Cryptopia Limited (in liquidation)* [2020] NZHC 728 at [147], [160] to [161].

1479 V Dixon, "The Legal Nature of Intermediated Securities: An Insurmountable Obstacle to Legal Certainty?" in L.Gullifer, J.Payne, *Intermediation and Beyond* (2019) pp 64 to 65. G Cooper "Virtual property as trust assets and investments" [2021] *Journal of International Banking and Financial Law* 751.

1480 The City of London Law Society expressed a similar conclusion based on the decision of the Court of Appeal in *Hunter v Moss* [1994] 1 WLR 452 in their response to our call for evidence. For a contrary view, see G Moss, "Issues Arising From Insolvency" in L Gullifer, J Payne, *Intermediated Securities – Legal Problems and Practical Issues* (2010) p 66, at which the author notes that "it cannot be said that uncertainty has been squeezed out of this particular conceptual problem. A statutory clarification would still be useful."

commingled, unallocated holdings of crypto-tokens. Instead, we consider that the courts will be able to develop coherent legal principles relating to crypto-token custody arrangements that can be characterised as trusts as appropriate, as they have done in the context of the broader intermediated securities markets. However, we are interested in consultees' views on these issues and as such, ask three related questions below.[1481]

Consultation Question 30.

16.75 We provisionally conclude that, under the law of England and Wales, crypto-token custody arrangements could be characterised and structured as trusts, even where the underlying entitlements are (i) held on a consolidated unallocated basis for the benefit of multiple users, and (ii) potentially even commingled with unallocated entitlements held for the benefit of the custodian itself. Do you agree?

16.76 We provisionally conclude that the best way of understanding the interests of beneficiaries under such trusts are as rights of co-ownership in an equitable tenancy in common. Do you agree?

16.77 Do you consider that providers and users of crypto-token custody services would benefit from any statutory intervention or other law reform initiative clarifying the subject matter certainty requirements for creating a valid trust over commingled, unallocated holdings of crypto-tokens? If yes, please explain what clarifications you think would assist.

Duties of crypto-token custodian trustees

16.78 Crypto-token custodians that operate platforms and offer services involving relationships that are characterised or structured as trusts will, as a result of their being trustees, be subject to a set of "baseline" obligations. Those obligations will comprise a duty of care, fiduciary duties and duties defined by the terms of the relevant trusts.[1482] However, those obligations can (subject to certain limits) be qualified. In general, the purpose of any such qualification would be to achieve a better alignment with the range of activities and allocation of risk agreed to or accepted by the parties to these relationships. This chapter does not consider the duties of crypto-token custodian trustees in detail. However, we briefly discuss the general law on breach of trust (and breach of fiduciary duty) in Chapter 19.

[1481] As we noted in our scoping paper on intermediated securities, it is now "reasonably well settled" that the arrangements between parties in an intermediated securities chain are characterised as a "series of trusts and sub-trusts". *Intermediated securities: who owns your shares? A scoping paper* (November 2020): https://www.lawcom.gov.uk/project/intermediated-securities/. See also *Re Lehman Brothers International (Europe) (in administration)* [2012] EWHC 2997 (Ch) at [163].

[1482] H Liu, L Gullifer and H Chong, "Client-intermediary relations in the crypto-asset world" (2020) *University of Cambridge Faculty of Law Research Paper No 18/2021* p 6. Alongside trust-based duties, crypto-token custodians will also likely be subject to additional private law obligations in contract and tort, depending on the terms agreed with and the circumstances of the relationships arising with users of their platforms and services. Crypto-token custodians may also be subject to regulatory and/or other statutory obligations depending on the particular activities they undertake and the particular products involved.

The boundaries of commercial trusts relationships for crypto-token custodians

16.79 Parties using trust structures governed by the law of England and Wales will have a degree of flexibility to define the scope and content of a trustee's rights and duties. They will also have some scope to define the extent of the liabilities incurred as a result of those duties being breached.[1483]

16.80 Particularly in the commercial context, the courts have been willing to uphold arrangements as valid trusts despite the incorporation of features that, on their face, appear to be inconsistent with a trust's fundamental aspects.

16.81 For example, in *Citibank v MBIA*,[1484] in the context of a securitised debt note issuance programme, the Court of Appeal recognised a trust as valid with its "irreducible core content"[1485] retained. This was despite the terms of the trust requiring the trustee in certain situations to comply with the instructions of a third-party guarantor without needing to have regard to the interests of the noteholder beneficiaries. The terms of the arrangements also exempted the trustee from all liability to the noteholder beneficiaries when so acting on the instructions of the guarantor.

16.82 Similarly, where an intermediary is granted a right to assert full title to, and use for its own commercial purposes, property that it purportedly holds for its users, it would perhaps not seem possible for a trust relationship to arise. Indeed, in the context of securities custody facilities, the existence of a right of use has been described as a "powerful contra-indication" to the recognition of a trustee/beneficiary relationship.[1486]

16.83 Nevertheless, the English and Welsh courts have held[1487] that where such a right requires (in exchange for its exercise) an alternative entitlement to be held for the account of the underlying user, the right should be more properly understood as a "right to swap". A right to swap (as opposed to a right of use, free from any exchange requirement) can exist as part of a valid trust, particularly where there are other "powerful factors pointing towards a trustee beneficiary relationship".[1488] This remains the case even if the intermediary is entitled to (i) exercise the right without giving specific advance notice of its intention to do so, and (ii) retain any and all profits, fees or benefits deriving from its use of the relevant property.

16.84 These decisions provide useful guidance on how and the extent to which crypto-token custodians can use trusts under the law of England and Wales to support commercial

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[1483] M Yates and G Montague, *The Law of Global Custody* (4th ed 2013) para 6.25.

[1484] [2007] EWCA Civ 11.

[1485] *Armitage v Nurse* [1998] Ch 241, in which Millett LJ stated at 253-254 that "If the beneficiaries have no rights enforceable against the trustees there are no trusts… The duty of the trustees to perform the trusts honestly and in good faith for the benefit of the beneficiaries is the minimum necessary to give substance to the trusts…". For a criticism of *Citibank v MBIA* based on *Armitage v Nurse* see A Trukhtanov "The irreducible core of trust obligations" (2007) 123 *Law Quarterly Review* 342, 345.

[1486] *Pearson, Lomas & ors v Lehman Brothers Finance SA & ors* [2010] EWHC 2914 (Ch) at [258] by Briggs J (as he then was).

[1487] *Pearson, Lomas & ors v RAB Market Cycles (Master) Fund Ltd & ors* [2009] EWHC 2545 (Ch) at [38], [60] to [64] by Briggs J (as he then was). *Pearson, Lomas & ors v Lehman Brothers Finance SA & ors* [2010] EWHC 2914 (Ch) at [293] by Briggs J (as he then was).

[1488] *Pearson, Lomas & ors v Lehman Brothers Finance SA & ors* [2010] EWHC 2914 (Ch) at [293].

multi-function or multi-service platforms. For example, a crypto-token custodian may want to retain a right to use crypto-token entitlements held for the account of its users so that they can be deployed to generate additional fees or income. Those additional fees or income might be generated through making loans to third parties or deposits to staking or other DeFi platforms. Such a right could be consistent with a trust if its exercise was conditional upon and undertaken in exchange for the custodian holding a substitute token for its beneficiary. This substitute asset could be a right against the borrower of the token to have an equivalent crypto-token entitlement transferred back at a later date. It could also be structured as a right against the borrower of the token to tokens provided by the borrower as loan collateral, or a claim to "liquidity provider"[1489] or other crypto-tokens received through the relevant DeFi platform.

16.85 The existence of a substitute token would be sufficient to enable the right of use to be characterised as a "right to swap". This could, in principle, be consistent with a trust arrangement, even if the profits generated from third party lending or DeFi activities were wholly or partly retained by the custodian.[1490] If, however, a crypto-token custodian wanted instead to retain the flexibility of a right of use free from any undertaking to provide a substitute token, this would still be possible under the law of England and Wales. But this would likely require a different legal framework not based on trusts and separate from any trust established for the safekeeping of crypto-token entitlements (such as an outright transfer/title retention arrangement).

16.86 With respect to the trustee's duty of care and positive obligations arising under the terms of the trust, carefully drafted limitation clauses can be used to prevent a custodian being held liable for some or all of the losses arising from their breach. This may be possible even where the trustee's conduct amounts to gross negligence.[1491] To be effective, the relevant provisions must have been clearly brought to the attention of trust beneficiaries. However, limitation language cannot absolve

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[1489] Liquidity provider tokens are tokens issued to liquidity providers on a decentralised exchange that run on an automated market maker protocol which facilitate trading of crypto-tokens through the creation of pooled tokens. The price of the tokens in the pool is determined by a mathematical formula (normally based on the quantity of tokens within the pool and other token pools). Often liquidity provider tokens will provide holders with certain rights or benefits such as enhanced returns or rewards on the provision of additional liquidity, other staked tokens, or governance rights.

[1490] However, exercising a right of use would effectively convert the user's equitable proprietary entitlement to a specific pool of crypto-tokens into an unsecured contractual claim to the return of equivalent crypto-tokens to those held in the pool. Without more and in isolation, this converts a trust into a title transfer / pure contractual arrangement in terms of the risks that a user is exposed to and the rights that they retain against the custodian. But the terms of the trust could still provide for additional protections. For example, to the extent that the custodian exercises a right of use over trust assets for the purposes of lending them to third parties, the contractual rights that the custodian has against those third parties for the return of equivalent assets could be held on trust for the user as could any rights to collateral posted by those third parties. This is specifically referenced as a possibility in *Pearson, Lomas & ors v Lehman Brothers Finance SA & ors* [2010] EWHC 2914 (Ch) at [240]. See also L Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th Edition 2017) para 6-55.

[1491] *Armitage v Nurse* [1998] Ch 241, read in conjunction with *Red Sea Tankers Ltd v Papachristidis (The "Hellespont Ardent")* [1997] 2 Lloyd's Rep 547 and *Camarata Property v Credit Suisse Securities* [2011] EWHC 479; L Tucker, N Le Poidevin, J Brightwell, *Lewin on Trusts* (20th ed 2020) para 41-130.

responsibility for fraud since this would undermine the "irreducible core content" of honesty that is the foundation of the trust relationship.[1492]

16.87 Limitation clauses can also be effective where the breach is due to the actions of a third party for which the custodian is responsible under the terms of the trust or as a matter of general trust law. This can be useful for crypto-token custodians that rely on third party sub-custodians to safeguard crypto-token entitlements that are the subject of a trust. Where a sub-custodian is appointed under section 17 of the Trustee Act 2000, a custodian trustee will in some circumstances not be liable for any act or default of the sub-custodian. This will likely be the case where the custodian trustee complies with the statutory duty of care in the appointment and supervision of sub-custodians and exercises powers of intervention where appropriate. It is likely that a similar liability standard will apply to sub-custodians appointed under powers granted by the terms of the trust. Additional limitation clauses can then be used to reduce this liability still further so long as the "irreducible core content" of the trust is not compromised.[1493]

16.88 With respect to fiduciary duties, a trust-based crypto-token custody relationship can be configured to modify (and a non-trust-based custody relationship can be configured to exclude) the operation of duties that would otherwise apply to the relationship, or certain elements of the relationship, in question. The approach of the courts has been to give primacy to both the express and implied terms[1494] of any contract(s) associated with or establishing the relevant relationship:[1495]

> The basic rights and liabilities of the parties and the fiduciary relationship, if it is to exist at all, must accommodate itself to its terms…. This applies with particular force when the parties are substantial financial institutions dealing on an arms-length basis.

16.89 In *Första AP-Fonden v Bank of New York Mellon*,[1496] the claimant was a Swedish pension fund. It brought a claim against Bank of New York Mellon, the fund's custodian, for losses sustained on cash collateral investments undertaken by the bank in connection with loans of the fund's securities to third parties. The court held that although commercial banking relationships did not ordinarily give rise to fiduciary duties, they could in principle apply to certain facilities provided by the bank — including its custody and securities lending agent services — due to the nature of the activities involved. However, the court found that, on the particular facts of the case, no fiduciary duties were owed. In reaching this conclusion, the court relied in part on the contractual terms agreed between the parties. These acknowledged the possibility of conflicts arising and the bank being entitled to enter into transactions in which it had

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1492 *Armitage v Nurse* [1998] Ch 241. D Hayton, "The Irreducible Core Content of Trusteeship" [1996] *Journal of International Trust and Corporate Planning* 3.

1493 Trustee Act 2000, ss 21 to 23. M Yates and G Montague, *The Law of Global Custody* (4th ed 2013) para 6.59 to 6.60.

1494 Fiduciary Duties of Investment Intermediaries (2014) Law Com No 350 paras 3.39 to 3.40 (analysing the decision of the Privy Council in *Kelly v Cooper* [1993] AC 205) and 10.8, 10.42 to 10.44, 10.49 and 10.52.

1495 *Första AP-Fonden v Bank of New York Mellon SA/NV & Ors.* [2013] EWHC 3127 (Comm) at [177] to [178], citing *Hospital Products Ltd v United States Surgical Corp* [1984] 156 CLR 41 at 97.

1496 *Första AP-Fonden v Bank of New York Mellon SA/NV & Ors.* [2013] EWHC 3127 (Comm).

an interest without making disclosure. Furthermore, they did not impose any obligation for the bank to arrange loans of the fund's securities where similar loans had been facilitated on behalf of other clients.[1497]

16.90 It is common practice for custodians operating in conventional securities markets to include in their services contracts provisions designed to modify implied fiduciary duties. These are intended to disclose, and thereby obtain informed consent to, conflicts of interest and to the generation and retention of profits, and to obtain permission for the relaxation of confidentiality obligations to permit the sharing of client information with affiliates and other third parties. We anticipate that a similar approach to controlling and defining the scope of fiduciary duties could also be effectively deployed in the context of crypto-token custody relationships.

16.91 The above analysis demonstrates that trusts provide a useful and versatile framework for structuring custody facilities both on a standalone basis and as part of a broader bundle of services. Trusts and the fiduciary obligations they give rise to have the potential to provide users of custody services with greater protection for their assets from both custodian insolvency risk and conflicts of interest. However, it is important to note that users cannot assume that such protection automatically applies without qualification or limitation merely due to the existence of a trust-based relationship. Particularly in a commercial context, the courts have recognised the validity of, and given effect to, a broad range of arrangements, seen as consistent with the law of trusts of England and Wales. The quality and scope of any legal safeguards available to users will ultimately be dependent therefore on the specific terms of the trusts agreed with, or undertaken by, the relevant custodian trustees.

INTERPRETING CRYPTO-TOKEN CUSTODY LEGAL FRAMEWORKS: INTRODUCING A PRESUMPTION OF TRUST?

16.92 As we outlined above,[1498] parties have different options for structuring direct custody facilities over crypto-tokens. The rights of users (whether represented by internal ledger account entries or instantiated as crypto-tokens) can be limited merely to personal contractual claims against the custodian for the delivery of crypto-token entitlements. Alternatively, users can benefit from equitable proprietary (and, where appropriate, co-ownership) claims as beneficiaries to crypto-token entitlements held on trust for them by the custodian. However, it may not be readily apparent to users which legal framework underpins the facilities they are accessing or with which they are interacting. Many operating models and service offerings could be characterised as granting users personal claims exclusively. Alternatively, other operating models and service offerings grant users claims that are (exclusively or additionally) trust-based and proprietary in nature. Furthermore, contractual and other documentation entered into, or published, in connection with crypto-token custody platforms may not

[1497] *Första AP-Fonden v Bank of New York Mellon* [2013] EWHC 3127 (Comm) at [173] to [174], [179], [275].

[1498] From para 16.42.

necessarily contain clear and unequivocal statements confirming the precise legal basis on which custody and any associated services are being provided.[1499]

16.93 The distinction between users having personal or proprietary rights to custodied crypto-token entitlements may seem to have limited direct impact or relevance to many everyday activities undertaken via custody platforms. However, the distinction has significant implications for the legal rights and responsibilities and the risk profiles of the parties involved.

16.94 In general, holders of personal unsecured contractual claims to the delivery of crypto-tokens are exposed to a much greater risk of substantial losses and limited recoveries in the event of a custodian insolvency than holders of equitable proprietary claims.[1500] Similarly, where custodied crypto-token entitlements are wrongfully transferred to, or misappropriated by, third parties, personal claim holders will be limited to any available remedies against the custodian only. In contrast, those with equitable proprietary rights may be able to bring (or potentially join the custodian in)[1501] actions against third parties directly. This may be the case where the relevant crypto-token holdings can be traced to assets held or attributed to transactions facilitated by such third parties.[1502]

16.95 From the custodian perspective, the distinction has implications for the baseline private law obligations that the custodian will owe to its users and the extent to which they can be validly modified or limited. Where users hold personal rights only, the custodian's liabilities will be confined to common law compensatory claims, primarily for breach of contract or in tort. Where users hold equitable proprietary rights, the custodian's liabilities will extend beyond common-law–based personal compensation claims and could potentially encompass claims for breaches of trust, fiduciary duty, or the trustee's (statutory or general equitable) duty of care. Breaches of trust or fiduciary duty can give rise to proprietary remedies and consequently, recourse to specific assets held by the custodian. We discuss these issues in more detail in Chapter 19.

16.96 However, subject to certain limitations (particularly in transactions involving consumers), the scope and substance of personal common-law-based liabilities can be confined and controlled effectively by incorporating exclusion and limitation clauses into the relevant contractual documentation. The same is also true of trust- and fiduciary-based liabilities, as long as any restrictions are consistent with the irreducible core content of trusteeship. Both models, therefore, provide custodians with considerable flexibility in controlling the substantive extent of their legal responsibilities for financial and operational risks associated with the services that they offer to users,

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1499 H Liu, L Gullifer and H Chong, "Client-intermediary relations in the crypto-asset world" (2020) *University of Cambridge Faculty of Law Research Paper No 18/2021* p 16, at which the authors note that for "client-intermediary agreements in the [crypto-token] context…the vast majority of such agreements are silent as to the exact nature of the legal relationship between the parties"; M Solinas, "Bitcoins in Wonderland: Lessons from the Cheshire Cat" [2019] 3 *Lloyd's Maritime and Commercial Law Quarterly* 433, 448.

1500 See also paras 16.52 to 16.53.

1501 Using the Vandepitte procedure, as set out in *Vandepitte v Preferred Accident Insurance Co* [1933] AC 70.

1502 D Fox, "Cryptocurrencies in the Common Law of Property" in *Cryptocurrencies in Public and Private Law* (2019) para 6.54. See also Chapter 19 where we discuss how the rules of tracing could apply to transfers of crypto-tokens in more detail.

particularly in a commercial context. Consequently, the choice of legal model has arguably its most significant practical impact in how it affects the rights of users and the risks to which they are exposed in a custodian insolvency.

16.97 Therefore, it could be argued that as a matter of policy, users should not be faced with large-scale losses in a custodian insolvency unless this risk has been clearly disclosed to, and accepted by, them. One possible way of achieving this through private law would be for the legal interpretation of a direct custody arrangement to be subject to a presumption that the relevant party or parties intend(s) for it to take effect as a trust. The courts could then give effect to this presumed intention, subject to the direct custody arrangement in question also satisfying the requirements of objects and subject-matter certainty discussed above.[1503]

16.98 The presumption could be held to apply unless there were:

(1) Clear and express indications that the entitlements of users or clients to interests in crypto-tokens held by the custodian were to constitute personal, unsecured claims only; and, possibly also

(2) Clear and express risk disclosures stating that in the event of the custodian's insolvency, such interests would be available for distribution to the custodian's creditors.

16.99 This presumption would therefore displace the law's general interpretive approach of applying an objective assessment to identify any intention to create a trust. It would also constitute an exception to the caution that the courts have otherwise deemed appropriate in business contexts specifically, which would ordinarily involve refraining from the "imposition" of a trust relationship where purely personal rights would be sufficient to achieve the parties' commercial objectives.[1504]

16.100 Applying an interpretive presumption that direct custody arrangements are intended by the relevant party or parties to be established as trusts under the law of England and Wales would be aligned with the most recent draft of the law reform proposals for crypto-token custody relationships being developed by the UNIDROIT Working Group. The UNIDROIT Working Group suggests that a "custody relationship" should be presumed where a service provider holds crypto-tokens on behalf of a client, and the client does not have the exclusive ability to effect a change of control of those tokens.[1505] "Custody relationship" in this context is specifically defined as an arrangement under which the crypto-tokens held will not be available "to the creditors of the custodian if the custodian enters into any insolvency proceeding". The proposed presumption would apply where the service provider is acting in the course of business and pursuant to an agreement. It would only be displaced if "it is clear from the wording of the agreement" that the client does not have the protection of the

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[1503] See paras 16.56, 16.64 to 16.74 above.

[1504] See para 16.57 above.

[1505] UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions)* Section V: Custody, Principles 12(1), 12(3) (and the associated commentary at para 6 p 27), and 14(3).

insolvency safeguards that are incorporated into the "custody relationship" definition.[1506]

16.101 If the UNIDROIT Working Group's current jurisdiction-neutral proposals were translated into the law of England and Wales, trust-based crypto-token direct custody facilities would likely be characterised as and consistent with the definition of a "custody relationship". A custody facility that purported to grant users only personal unsecured contractual (and possibly even no legally enforceable) rights to the delivery of crypto-tokens would need to satisfy specific requirements to be effective at law in displacing the presumption that a trust was intended. The courts would characterise a custody arrangement as or involving a trust unless the underlying agreement clearly stated that the insolvency safeguards referenced in the "custody relationship" definition were inapplicable. The statements would need clearly to confirm that a user's rights to the delivery of crypto-tokens would not have the benefit of recourse to any specific crypto-token entitlements held by the custodian in priority to the claims of the custodian's unsecured creditors. Without these statements the presumption would not be displaced, and the custody facility would be characterised as intending to create a trust relationship.

16.102 We accept that there are good policy justifications for adopting a presumption of trust for crypto-token custody facilities. Users would, in general and as an automatic principle, be considerably better protected from custodian insolvency risk. Custodians would be incentivised to draft clearer, more transparent terms of use and service agreements.

16.103 However, a presumption of trust could create uncertainty for platforms that may not traditionally be regarded, but could nevertheless be characterised as, custody facilities. This would potentially expose any parties controlling such platforms to legal liabilities and obligations that they would not necessarily have anticipated or made provision for. Depending on how broadly the concept of a "custody relationship" were interpreted by the courts, such a presumption could apply not only to conventional intermediary custodians and custodial exchanges, but also potentially to certain (centrally controlled) "lock and mint" facilities. These could include crypto-token bridges, wrapping protocols, collateralised lending arrangements, fractional ownership, and collateralised tracker-token issuance platforms.[1507]

16.104 While acknowledging the user protection benefits of a presumption of trust, we believe that adopting an interpretive principle of uncertain scope and application could diminish the capacity of the law of England and Wales to support innovation in, and broader engagement with, emerging crypto-tokens applications and markets. Additionally, we think that this would also introduce an arbitrary and unjustified distinction between the legal treatment of custody services for crypto-tokens and similar services for other asset types to which the presumption did not apply. On balance therefore, we do not propose changes in law or in the interpretive approach of

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[1506] UNIDROIT Digital Assets and Private Law Working Group, *Study LXXXII – W.G.5 – Doc. 3: Master Copy of the Principles, plus Commentary (with Questions),* Section V: Custody, Principles 12(1), 12(3) (and the associated commentary at para 6 p 27), and 14(3).

[1507] We understand however that this is an issue that is currently being considered by the UNIDROIT Working Group and therefore that the current draft of the principle as described in this chapter is subject to further revisions.

the courts to be introduced that would apply such a presumption to crypto-token custody facilities.

16.105 We believe that upholding party autonomy and giving market participants the freedom to choose the legal structure that is best suited for their particular operating, transactional and business models is and remains the right approach from the perspective of the private law of England and Wales. Furthermore, we agree that when considering the characterisation of crypto-token custody facilities in a business context in particular, "the law should not unthinkingly impose a trust where purely personal rights between the contracting parties sufficiently achieve their commercial objective".[1508] That being said, the law is sufficiently flexible that a court may find the existence of a trust in appropriate circumstances.

16.106 Improving user protection and incentivising greater clarity and transparency in the disclosure and description of risks and legal rights associated with crypto-token custody facilities are legitimate and important policy objectives. However, we provisionally conclude that reform to the underlying principles of trust law to introduce a presumption of trust for arrangements where direct custody services in respect of crypto-tokens are provided is not the most effective means of achieving these objectives. We note also that there are ongoing regulatory initiatives which may be able to address and target these issues more appropriately than changes to private law principles of interpretation.[1509]

Consultation Question 31.

16.107 We provisionally conclude that a presumption of trust does not currently apply to crypto-token custody facilities and should not be introduced as a new interpretive principle. Do you agree?

[1508] *Wang v Darby* [2021] EWHC 3054 (Comm) at [52], endorsing *Pearson, Lomas & ors v Lehman Brothers Finance SA & ors* [2010] EWHC 2914 (Ch), proposition (ix)(b) at [225].

[1509] In addition, regulatory issues are outside the scope of this consultation paper. For further details of ongoing and completed initiatives concerning the regulation of crypto-token markets and related activities see the guidance produced by the Financial Conduct Authority (Financial Conduct Authority, "Cryptoassets: our work": https://www.fca.org.uk/firms/cryptoassets); the HM Treasury Consultation on cryptoassets and stablecoins: https://www.gov.uk/government/consultations/uk-regulatory-approach-to-cryptoassets-and-stablecoins-consultation-and-call-for-evidence; and the analysis by the Bank of England on cryptoassets and financial stability (Bank of England Financial Policy Committee, "Financial Stability in Focus: Cryptoassets and decentralised finance" (March 2022): https://www.bankofengland.co.uk/-/media/boe/files/financial-stability-in-focus/2022/cryptoassets-and-decentralised-finance.pdf). The FCA also explicitly discussed the possibility of using aspects of the existing Client Assets Sourcebook (CASS) regime to build out a regulatory regime for custody of crypto-tokens at the first CryptoSprint events hosted by the FCA in May and June 2022, see: https://www.fca.org.uk/firms/cryptoassets/cryptosprint, at "Custody".

Chapter 17: Custody of crypto-tokens: law reform proposals

17.1 In the previous chapter we considered the ways in which custody arrangements in respect of crypto-tokens might be structured. In this chapter we outline law reform proposals in connection with the following issues affecting crypto-token custody arrangements:

(1) Whether the validity of certain transactions under trust-based crypto-token custody arrangements might be subject to the statutory formalities in section 53(1)(c) of the Law of Property Act 1925 ("LPA 1925") and, if so, how such formalities could be satisfied.

(2) Whether the efficient and speedy resolution of crypto-token custodian insolvencies would benefit from changes to the allocation of shortfall losses arising in connection with commingled unallocated accounts or pools of crypto-tokens held on trust.

(3) Whether crypto-token custodians would benefit from having an expanded range of options for structuring legally-effective custody facilities, by extending or developing an equivalent to the concept of bailment which could apply to arrangements in respect of crypto-tokens.

DEALINGS IN TRUST-BASED CRYPTO-TOKEN CLAIMS: SECTION 53(1)(C) LPA 1925

17.2 As explained in Chapter 16, trusts can provide a versatile and robust legal framework for custodians to hold crypto-tokens on behalf of third parties or to support the issuance of proprietary entitlements to assets represented by or linked to crypto-tokens. However, market participants may require clarity and certainty as to how such trust structures operate in practice before electing to use them more broadly in commercial arrangements and transactions.

17.3 The deployment of trusts could be hindered by (perceived or actual) lack of clarity relating to the possible application of statutory formalities. In general, statutory formalities in this context are procedures that the relevant party or parties must comply with for certain transfers of and dealings in equitable interests to be legally valid and effective.

17.4 The principal provision that potentially raises perceived or actual ambiguity in the context of (trust-based) crypto-token custody arrangements is section 53(1)(c) LPA 1925. It provides that:

> a disposition of an equitable interest or trust subsisting at the time of the disposition, must be in writing signed by the person disposing of the same, or by his agent thereunto lawfully authorised in writing or by will.

17.5 Breaking it down, this statutory provision requires that:

(1) any transfer of or dealing in an existing equitable interest;

(2) that constitutes a "disposition";

must be:

(3) made in writing;

(4) signed by (or by the agent of) the person making it.

Where applicable, failure to comply with the "in writing" requirement renders the transfer or dealing void and legally ineffective.

17.6 We consider these elements below. The challenge for crypto-token custodians is in determining, to a sufficient degree of certainty, whether any of the transfers and dealings that they are commonly involved in are captured by section 53(1)(c) LPA 1925. This may not necessarily be straightforward, due to a lack of clarity as to both the meaning of "disposition" and also the scope and implications of the rule's underlying policy objective of preventing fraud.[1510]

A transfer or dealing in an equitable interest

17.7 As noted above and in Chapter 16, equitable interests in trust-based crypto-token custody facilities can be represented by ledger entries in an intermediary's internal books and records (such as account balances at a crypto-token custodial exchange).

17.8 Equitable interests in trust-based crypto-token custody facilities could also be represented by crypto-tokens (for example, where such tokens are minted in connection with the locking of other crypto-tokens in connection with a bridging or wrapping protocol).[1511]

17.9 If transfers of such equitable interests constitute dispositions within the meaning of section 53(1)(c) LPA 1925 they would need to comply with the "in writing signed" formalities specified by that rule.

The meaning of "disposition"

17.10 The LPA 1925 does not include any comprehensive definition of the term disposition.[1512] The courts have indicated that the term should be given its "ordinary" and "natural" meaning.[1513] Beyond stating that in the context of section 53(1)(c) LPA 1925 this requires an interpretation that is not limited solely to "grants and

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[1510] The provision replaced s 9 of the Statute of Frauds 1677. However, as discussed at paragraphs 17.17 to 17.23 below, there is debate about the type of fraud it is intended to prevent.

[1511] Crypto-tokens can also be used to represent (or to be "linked to") other equitable interests that are not necessarily related to the crypto-token markets. For example, where crypto-tokens are used as a register of equitable interests under a trust the subject matter of which is not crypto-token related.

[1512] Although LPA 1925, s 205(1)(ii) provides that the term disposition is to be interpreted to include a mortgage, charge, lease, assent, vesting declaration, vesting instrument, disclaimer, release, and every other assurance of property, unless the context otherwise requires.

[1513] *Grey v IRC* [1960] AC 1 (HL); p 2 (per Viscount Simonds) and 15 (per Lord Radcliffe). The House of Lords rejected the submission that this should be given the same (narrower) interpretation as s 9 of the Statute of Frauds, which used the phrase "grants and assignments".

assignments", however, they have only provided limited (and somewhat conflicting) guidance as to what that meaning entails.[1514]

17.11 Hin Liu suggests that:[1515]

> the concept of "disposition" clearly includes: (i) an assignment (or "straight transfer") of an equitable interest, as well as; (ii) a direction by a beneficiary to a trustee to hold on trust for a third party. Equally clearly, it does not cover the extinction of an equitable interest as a result of dealings with the legal interest (as seen in the *Vandervell* scenario[1516] where the direction is to transfer the entire legal and beneficial interest to a third party): in this situation, the beneficial interest is extinguished rather than disposed of. Nor does "disposition" cover the creation of a sub-trust.

17.12 Intermediated holding structures for, and related dealings in, claims to custodied crypto-token entitlements are similar in many respects to arrangements and transactions in investment securities held through intermediaries.[1517]

17.13 In determining the implications of section 53(1)(c) LPA 1925 for custodied crypto-token entitlements, it can therefore be a helpful starting point to consider how the formalities rule has been interpreted and understood in the context of intermediated securities.[1518] This has been the subject of substantial analysis in recent years by academic commentators, practitioners and the courts, as well as by the Law Commission in our 2020 scoping paper.[1519]

17.14 It has been suggested that the application of section 53(1)(c) LPA 1925 depends solely or primarily on the appropriate technical legal characterisation of the transaction. For example, a transfer of interests in securities between account holders at the same intermediary custodian may be best understood as a direction by the transferor account holder to its trustee to hold its equitable entitlement on trust for the transferee. If so, this would appear to be a "disposition" within the meaning of the

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1514 For an in-depth analysis of the relevant caselaw see B Green, "Grey, Oughtred and Vandervell – A Contextual Reappraisal" (1984) 47 *Modern Law Review* 385, and B McFarlane and C Mitchell, *Hayton and Mitchell on the Law of Trusts and Equitable Remedies* (14th ed 2015) paras 3-050 to 3-103.

1515 H Liu, "Transfers of equitable interests in the digital asset world" (2022) 5 *Journal of International Banking and Financial Law* 325, 326.

1516 *Vandervell v IRC* [1967] 2 AC 291 (HL), 310 to 311.

1517 Intermediated securities are interests in investment securities such as shares which are held by participants through a chain of intermediaries. The Uncertificated Securities Regulations 2001, SI 2001 No 3755, reg 38(5), disapplies section 53(1)(c) LPA 1925 for transfers effected in CREST. CREST is the central securities depository in the United Kingdom and records the direct holders of uncertificated securities. However, most investors hold securities through a chain of financial institutions, such as banks, investment platforms and brokers ("intermediaries"), and are not therefore directly named on CREST. There is no statutory disapplication of section 53(1)(c) LPA 1925 for the transfers of interests in securities which are effected at a lower tier in the intermediated securities chain.

1518 Specifically, to transactions undertaken via lower tier intermediaries outside the CREST system. For transactions effected through CREST, section 53(1)(c) LPA 1925 is expressly disapplied by reg 38(5) of the Uncertificated Securities Regulations 2001, SI 2001 No 3755.

1519 *Intermediated securities: who owns your shares? A scoping paper* (November 2020): https://www.lawcom.gov.uk/project/intermediated-securities/.

rule.[1520] On this interpretation the transfer would trigger the in writing requirement (which we discuss in more detail at paragraphs 17.36 to 17.39 below).

17.15 Alternatively, it is possible to view this kind of transfer as fundamentally taking effect by way of novation. On this analysis, the transferor's equitable entitlement is extinguished on transfer and replaced by the creation of a new equitable entitlement on behalf of the transferee. If correct, then it could be argued that such "transfers" do not constitute dispositions.[1521] However, this line of analysis could be criticised for conflating the contractual and equitable elements of the transfer, utilising the nature of the effect of the former at law to support a conclusion as to the characterisation of the latter in equity for the purposes of section 53(1)(c) LPA 1925.

17.16 A further alternative may be applicable where the entitlements of account holders can best be understood as equitable co-ownership rights in securities held by custodians in accounts for their clients collectively on a pooled and unallocated basis. Such accounts (used to hold the assets of more than one investor) are often referred to as "omnibus" accounts. In this context, transfers between account holders could be treated not as dispositions, but as a form of succession to, and involving the class of, clients on whose behalf the securities are held. The closest analogy would be with the legal treatment of changes in membership of unincorporated associations.[1522]

Interpreting the fraud prevention purpose underlying section 53(1)(c) LPA 1925

17.17 It has also been argued that the scope and application of section 53(1)(c) LPA 1925 cannot be resolved only by reference to the precise legal characterisation of the specific form of dealings in equitable interests in a mechanical sense. Under this argument, whether the statutory formalities rules apply or not is, in addition, partly

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[1520] *Grey v IRC* [1960] AC 1 (HL), Viscount Simonds at p 12 to 13; Lord Radcliffe at p 15. While this conclusion would probably be appropriate for a transfer properly so characterised when viewed in isolation, its application in practice becomes more complex where custodians routinely settle transfers between account holders in batches and on a net basis (M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd Ed 2021) para 27-050 n 200).

[1521] M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) para 27-050. See also M Solinas, "Bitcoins in Wonderland: Lessons from the Cheshire Cat" [2019] 3 *Lloyd's Maritime and Commercial Law Quarterly* 433, 451. The author endorses a novation analysis for transfers of internal book entry entitlements between account holders at the same crypto-token custodian where the accounts are subject to trusts under the law of England and Wales. Similarly, in C Mitchell, P Matthews, J Harris, S Agnew, *Underhill & Hayton: Law of Trusts & Trustees* (20th ed 2022) para 12.37, the authors suggest that the application of s 53(1)(c) LPA 1925 could be circumvented by treating — as a matter of contract — transfers by a beneficiary account holder as grants of authority to the custodian to recognise that the transferor beneficiary no longer retains or retains only a reduced equitable entitlement and that some transferee beneficiary now has enlarged or new equitable entitlements, and that accordingly the transferor beneficiary is thereby prevented from asserting any claim to the contrary. However, it is not at all certain that the courts would necessarily adopt a sufficiently narrow interpretation of "disposition" to exclude "extinction and creation" dealings of this type. See, for example, J Benjamin, *Interests in Securities* (2000) para 3.39, in which the author sets out the above argument but concludes nevertheless that it "would be prudent to assume that a novation is a disposition".

[1522] See J Benjamin, *Interests in Securities* (2000) para 3.40.

determined by the type of fraud the provision is intended to prevent (in other words, by reference to its underlying purpose as a safeguard against certain types of fraud).[1523]

17.18 In *Vandervell v Inland Revenue Commissioners*,[1524] Lord Upjohn said in the House of Lords:

> the object of the section, as was the object of the old Statute of Frauds, is to prevent hidden oral transactions in equitable interests in fraud of those truly entitled, and making it difficult, if not impossible, for the trustees to ascertain who are in truth his beneficiaries.

17.19 Academic commentators have interpreted this analysis as stating that the purpose of the rule is to protect both trustee and beneficiary from a particular form of fraud. That is, the risk that a beneficiary (or purported beneficiary) fraudulently asserts that there is a trust in its favour when there is in fact no such trust. In those circumstances, there is a risk that the trustee would administer the trust in favour of the wrong person as a result of illegitimate claims to beneficial entitlement.

17.20 If this interpretation is correct, the provision is not directed at the possibility of frauds perpetrated *by the trustee* (for example, where a trustee fraudulently denies the existence of a trust in favour of the beneficiary, when such a trust in fact exists). The argument would then be that section 53(1)(c) LPA 1925 does not apply to dealings in equitable interests that necessarily require the involvement of the trustee.[1525]

17.21 Lord Upjohn's approach informed the non-binding comments of Mr Justice Hildyard in *SL Claimants v Tesco plc*.[1526] In that case, Mr Justice Hildyard noted that although transfers in intermediated securities could in a technical sense be regarded as dispositions, they did not raise fraud concerns of the type that section 53(1)(c) LPA 1925 was intended to safeguard against. Accordingly, those types of transfers fell outside the scope of the rule.[1527] Although the meaning of the judge's comments are not entirely free of ambiguity, Mr Justice Hildyard appeared to be suggesting that the boundaries of section 53(1)(c) LPA 1925 were defined by reference to a two-stage test that incorporated both technical and purposive elements. For any particular dealing in an equitable interest to fall within the scope of the rule it would have to both (i) constitute a "disposition" in a mechanical sense, and (ii) occur in a context where there was a risk it could be exploited for the fraudulent or otherwise illegitimate assertion of an equitable interest to the detriment of the trustee and/or the claims of genuine beneficiaries.

[1523] H Liu, "Transfers of equitable interests in the digital asset world" [2022] *Journal of International Banking and Financial Law* 325, 328 to 330.

[1524] *Vandervell v Inland Revenue Commissioners* [1967] 2 AC 291 at 311. LPA 1925, s 53(1)(c) replaced section 9 of the Statute of Frauds 1677. See also the purpose of formalities in Electronic Execution (2019) para 2.11.

[1525] See the analysis of Lord Upjohn's judgment in *Vandervell v IRC* [1967] 2 AC 291 in B McFarlane and C Mitchell, *Hayton and Mitchell on the Law of Trusts & Equitable Remedies* (14th ed 2015) paras 3-077 to 3-079.

[1526] [2019] EWHC 2858 (Ch).

[1527] Above at [116].

17.22 Uncertainty over the relevance of the fraud prevention policy objective underpinning section 53(1)(c) LPA 1925 is potentially compounded still further by a lack of clarity as to the precise meaning of fraud in this context. Section 53(1)(c) LPA 1925 is a safeguard against instances of persons fraudulently asserting illegitimate claims to equitable entitlements of the type referred to by Lord Upjohn in *Vandervell v IRC*.[1528] However, its application could also be justified (under a more expansive interpretation of the conception of fraud relevant to the rule) in scenarios where a trustee fraudulently denies recognition to persons with legitimate claims to equitable entitlements.[1529]

17.23 Any actual or perceived ambiguity as to the scope of section 53(1)(c) LPA 1925 could undermine confidence in the efficacy of numerous activities undertaken in connection with crypto-token custody arrangements if they have been structured under or characterised as being governed by trust law.[1530] Some common examples are set out in the following (non-exhaustive) list.[1531]

Examples of dealings in or involving book entry crypto-token entitlements

17.24 There are at least two types of possible dealings in or involving book entry equitable crypto-token entitlements.

Internal transfers between account holders at the same custodian

17.25 If these transfers are properly characterised as directions from account holder to custodian, and the scope of section 53(1)(c) LPA 1925 is determined solely by the technical nature of the transaction, then they would be subject to the rule.

17.26 Counterarguments can, however, be made that they fall outside section 53(1)(c) LPA 1925 on the basis that:

[1528] [1967] 2 AC 291.

[1529] For further commentary on the distinction between claims of fraudulent assertion and fraudulent denial in the context of dealings in equitable entitlements to crypto-tokens, see H Liu, "Transfers of equitable interests in the digital asset world" [2022] *Journal of International Banking and Financial Law* 325. The author argues that the application of section 53(1)(c) LPA 1925 in practice is problematic due to ambiguity affecting its technical scope as well as vagueness in its underlying normative foundations, describing such multi-dimensional uncertainty as "the worst of both worlds".

[1530] For additional commentary on the challenges of interpreting the notion of a "disposition" under s 53(1)(c) LPA 1925 for specific dealings in book-entry and "on-chain" equitable entitlements to crypto-tokens see H Liu, "Transfers of equitable interests in the digital asset world" [2022] *Journal of International Banking and Financial Law* 325.

[1531] The dealings referred to in this section are all outright transfers and do not involve grants of security interests. Security interests over direct and indirect holdings of crypto-tokens are considered more fully in Chapter 18 on crypto-token collateral arrangements. As a result of s 205(1)(ii) LPA 1925, "disposition" is expressly stated to encompass "a conveyance", which that provision defines as including "*a mortgage* [or a] *charge*….". Consequently, where a grant of security over intermediated crypto-tokens is made by way of mortgage (but not a charge since although that would constitute a disposition it would be of a "new" and not of a "subsisting interest) it will fall within and will need to comply with the writing requirements of s 53(1)(c) LPA 1925, unless the grant is also a financial collateral arrangement, in which case the formalities are expressly disapplied (see reg 4(2) Financial Collateral Arrangements (No 2) Regulations 2019 (see further Chapter 18 para 18.48).

(1) in a technical sense, they do not constitute dispositions but involve a transfer by way of novation or, alternatively, a grant of authority to the custodian to facilitate the extinction and creation of equitable entitlements;[1532]

(2) in a technical sense, they do not constitute dispositions but involve a process analogous to succession and changes in membership of unincorporated associations;[1533] or

(3) even if they constitute dispositions in a technical sense, they do not involve the type of fraud risk that the rule is intended to address.[1534]

External transfers to an account or address owned and controlled by the transferor or by another person

17.27 Potentially more straightforward, but still not entirely free of uncertainty, are external transfers to an account or address owned and controlled by the transferor (either directly or via a different intermediary custodian), or by another person (either directly or via a different intermediary custodian). Examples of this type of transfer would include where a user:

(1) instructs a custodial exchange to transfer crypto-tokens from the user's exchange account to an external, user controlled self-custody holding arrangement; or

(2) instructs a custodial exchange to transfer crypto-tokens from the user's exchange account to an account that the user maintains at another exchange.

17.28 These transfers would appear to fall outside of section 53(1)(c) LPA 1925. They amount to a termination of the trust relationship as between account holder and custodian, followed by a transfer of full legal (or superior equitable) and beneficial title via a transaction that necessarily requires the involvement of the custodian. Where a third-party intermediary is involved, there is then also a subsequent declaration of trust and creation of a new equitable interest by that third party.[1535]

Examples of dealings in tokenised equitable entitlements to custodied crypto-tokens

17.29 There are also at least two types of possible dealings in tokenised equitable entitlements to custodied crypto-tokens.

[1532] See para 17.15.

[1533] See para 17.16.

[1534] See paras 17.17 to 17.23.

[1535] *Vandervell v IRC* [1967] 2 AC 291 (HL) at 311 by Lord Upjohn; C Mitchell, P Matthews, J Harris, S Agnew, *Underhill & Hayton: Law of Trusts & Trustees* (20th ed 2022) para 12.31. The result would appear to be the same if the custodian did not hold legal title to the underlying crypto-token but only a superior equitable interest under a higher-tier trust: *In the Matter of Lehman Brothers International (Europe) (in administration)* [2012] EWHC 2997 (Ch), [165]- [167] (per Mr Justice Briggs), considered in G Yeowart, R Parsons, E Murray and H Patrick, *Yeowart and Parsons on The Law of Financial Collateral* (2016) paras 4.41 - 4.43. However, certain elements of these types of transfers could still potentially be at risk of being characterised as dispositions: see M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 27-050 n 200).

A transfer of control of crypto-tokens from one network address to another where the recipient address is controlled by a different person (other than to the custodian in its capacity as trustee)

17.30 This would include a peer-to-peer transfer of tokenised equitable entitlements from an address controlled by one user to a different address controlled by a different user.

17.31 If the proper characterisation of the transaction is as a delivery to the recipient in unchanged form of uniquely identifiable assets, this would likely be characterised as a disposition by way of an assignment or constituting a direction to the custodian and subject to section 53(1)(c) LPA 1925.

17.32 However, in Chapter 12 we suggest that the proper characterisation of the transaction could be as a consumption, cancellation or destruction of the pre-transfer crypto-tokens controlled by the transferor and a resulting and corresponding causal creation of a new, modified or causally-related crypto-tokens. On that basis, it could be argued that the transaction constitutes an "extinction and creation" of equitable entitlements and could therefore fall outside the scope of section 53(1)(c) LPA 1925.[1536]

17.33 Additionally, if the crypto-tokens represent equitable co-ownership interests, it could be argued that the transfer does not constitute a disposition for the purposes of section 53(1)(c) LPA 1925. Instead, it involves a process analogous to succession and changes in membership of unincorporated associations.

Transfer of control of a crypto-token from one network address to another, where the recipient address is either an address with no (or no known) private key or an address controlled by the custodian in its capacity as trustee

17.34 This could occur in connection with a redemption transaction through a "lock and mint" facility operated by a crypto-token bridge.[1537] It involves a user relinquishing control of minted tokens on a destination network to acquire or retrieve control of locked tokens on the underlying source network. Upon completion of, or simultaneous with, the transfer (which constitutes a "burn" or "redemption" transaction), a corresponding amount of the crypto-tokens held in custody will be released to a network address under the control of, or as specified by, the transferor.

17.35 This type of transfer would appear to fall outside section 53(1)(c) LPA 1925 on the basis that it amounts to a termination of the trust relationship as between account holder and custodian, followed by a transfer of full legal (or superior equitable) and beneficial title via a transaction that necessarily requires the involvement of the custodian.

SATISFYING THE "IN WRITING" AND "SIGNED" REQUIREMENTS

17.36 Section 53(1)(c) LPA 1925 requires that there is a written record of the transaction, which is signed by or on behalf of the person making the transfer. There may be a

[1536] See Chapter 12.

[1537] See Chapter 16 from para 16.29.

degree of uncertainty as to how dealings in equitable entitlements to crypto-tokens falling within this provision can comply with these requirements.

17.37 We think it is certainly possible that specific forms of electronic communication used in connection with intermediated and "on chain" network transfers could satisfy both the writing and signature elements of the stipulated formalities,[1538] though this may depend on how the disposition is effected. Ought the records of internal or external ledgers, associated transaction instructions, and digital signatures generated through public – private key cryptography be regarded as sufficient to satisfy the requirements?

17.38 We previously noted that the common law "takes a pragmatic approach to the electronic execution of transactions".[1539] Digital information represented or displayed on a screen satisfies the broad definition of "in writing" in the Interpretation Act 1978.[1540] In relation to electronic signatures, we also concluded that the common law does not prescribe any particular form or type of signature, provided that the signatory intends to authenticate the document.[1541] The courts have held that a name typed at the bottom of an email, clicking "I accept" on a website and the header of a SWIFT message constitute valid signatures.[1542] In addition, in our recent advice on smart legal contracts, we concluded that source code[1543] was capable of satisfying a statutory "in writing" requirement.[1544] We also expressed the view that a digital signature generated through public key cryptography was capable of fulfilling a statutory requirement for a signature in principle where it indicates an intention to authenticate a transaction.[1545] In the context of dealings in intermediated entitlements

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[1538] Law Commission of England and Wales, *Intermediated securities: who owns your shares? A Scoping Paper* (2020) paras 7.51–7.52; and Electronic Execution (2019) Law Com No 386. See also C Mitchell, P Matthews, J Harris, S Agnew, *Underhill & Hayton: Law of Trusts & Trustees* (20th ed 2022) para 12.14, where the authors argue that for the purposes of s 53(1)(c) LPA 1925, writing would extend "to electronic communications as in emails, and a deliberately inserted signature therein [would] suffice but not one automatically inserted."

[1539] Electronic Execution (2019) Law Com No 386 pp 2 to 3.

[1540] "'Writing' includes typing, printing, lithography, photography and other modes of representing or reproducing words in a visible form, and expressions referring to writing are construed accordingly": sch 1 Interpretation Act 1978.

[1541] Electronic Execution (2019) Law Com No 386 pp 2 to 3.

[1542] See the analysis and caselaw cited at footnotes 13 to 15, Electronic Execution (2019) Law Com No 386 p 3. See also G Cooper "Virtual property as trust assets and investments" [2022] *Journal of International Banking and Financial Law* 751, 753 where the author notes that for the purposes of section 53(1)(c) LPA 1925, "[t]he requirement of a signature might be satisfied by a digital signature".

[1543] The "high level" programming language that code is usually drafted in, using a combination of words and symbols and that can be read by an experienced coder (Law Commission of England and Wales, "Smart Legal Contracts – Advice to Government" (2022) para 3.81).

[1544] Law Commission of England and Wales, "Smart Legal Contracts – Advice to Government" (2022). At para 3.97 we state that "We do not consider that … an amendment [to the 1978 Act to recognise source code] is necessary. The definition of "writing" in the 1978 Act is not confined to a particular form or type of writing: it encompasses any mode of "representing or reproducing words in a visible form". So long as the relevant statute does not indicate a contrary intention (either explicitly or on the basis of its context), source code will satisfy a specific statutory "in writing" requirement."

[1545] Law Commission of England and Wales, "Smart Legal Contracts – Advice to Government" (2022), from para 3.76.

to investment securities, we acknowledged that if section 53(1)(c) LPA 1925 applies,[1546] the records generated and authentication processes implemented by the technological systems through which they are executed could potentially satisfy the rule's in writing" and "signed" requirements respectively.[1547]

17.39 Whether a particular electronic communication or method of signing satisfies a particular statutory requirement for "in writing" or "signed" will also depend on the intention of Parliament when enacting that specific requirement, and in particular whether the statute contains or implies a contrary intention.[1548] The types of communications that could satisfy the formalities requirement could vary depending on the purpose of the rule and the types of fraud that it is intended to guard against.

(1) The provision could be taken to be limited to preventing illegitimate claims to beneficial entitlements based on the fraudulent assertion of beneficial status by a beneficiary (or purported beneficiary). Its purpose would therefore be to require fulfilment of an evidential function by ensuring a durable record of the existence of a transaction and/or the true sequence of events associated with a transaction. If so, then records of internal or external ledgers, associated transaction instructions and digital signatures generated through public–private key cryptography could be regarded as sufficient to satisfy the "in writing" and "signed" requirements.[1549] Indeed, it is our view that this interpretation reflects the core fundamental purpose of section 53(1)(c) LPA 1925.

(2) However, some argue that the provision extends also to preventing illegitimate denials of recognition to valid beneficial entitlements by fraudulent custodian trustees. This would suggest that a requirement for additional, supplemental records could be justified, particularly if the custodian has control over when and how either internal or "on chain" ledger updates are made to reflect

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[1546] As noted at paras 17.15 and 17.21 there are good arguments (such as the novation analysis and/or the two-stage test alluded to by Hildyard J in *SL Claimants v Tesco plc* [2019] EWHC 2858 (Ch) at [116]) for concluding that dealings in equitable entitlements to intermediated securities are outside the scope of section 53(1)(c) LPA 1925. See also Law Commission of England and Wales, *Intermediated securities: who owns your shares? A Scoping Paper* (2020) paras 7.47 to 7.49.

[1547] Law Commission of England and Wales, *Intermediated securities: who owns your shares? A Scoping Paper* (2020) paras 7.50 to 7.52.

[1548] See further: Law Commission of England and Wales, "Smart Legal Contracts – Advice to Government" (2022) paras 3.101 and 3.106.

[1549] H Liu, "Transfers of equitable interests in the digital asset world" [2022] *Journal of International Banking and Financial Law* 325, 328; Law Commission of England and Wales "*Intermediated securities: who owns your shares? A Scoping Paper*" (2020) para 7.52; D Turing, "Intermediated securities – Call for evidence" (26 October 2019). The author notes (at para 35, citing the Law Society Practice Note, "Execution of a document using an electronic signature" (21 July 2016)), "a custodian's or broker's electronic communications methodology for transmission of instructions would usually comply with the statutory requirements [of s 53(1)(c) LPA 1925] for 'writing' and 'signature'". However, The City of London Law Society ("CLLS") expresses a different opinion, stating that if s 53(1)(c) LPA 1925 applies to lower-tier transfers of intermediated securities outside the CREST system "there would be a material concern that the writing formalities of these provisions required to render a disposition of an equitable interest valid or the assignment of a legal chose in action effective against third parties (to the extent applicable) might not, in practice, be satisfied in relation to a transfer of intermediated securities across an intermediary's books": The CLLS "Response of the Joint Working Party of the City of London Law Society Company Law, Financial Law and Regulatory Law Committees to the Law Commission's Consultation on Intermediated Securities" (8 November 2019) p 27.

dealings in such entitlements.[1550] Supplemental or alternative records could also be justified if the provision also fulfilled a "cautionary" purpose, ensuring that particular financial undertakings are properly considered and understood before being committed to.[1551]

SECTION 53(1)(C) LPA 1925: CONCLUSIONS AND PROPOSALS FOR REFORM

17.40 There are a range of possible and, in our view, strong arguments for asserting that dealings in book entry and tokenised equitable entitlements to crypto-tokens fall outside the scope of section 53(1)(c) LPA 1925. Additionally, or in the alternative, there are strong arguments that any such dealings are in fact carried out by forms of electronic communication and authentication that satisfy the formality requirements of section 53(1)(c) LPA 1925.

17.41 It may therefore be legitimate to conclude that the interpretation and application of section 53(1)(c) LPA 1925 as currently drafted is sufficiently clear, is unlikely to cause any real problems for crypto-token custodians in practice, and that accordingly, legislative reform is unnecessary. This conclusion could be justified not only on the basis of the analytical arguments set out above but also in part by drawing parallels from the results of our recent consultation on intermediated securities. In our 2020 scoping paper, we noted the lack of specific examples or evidence from consultees of section 53(1)(c) LPA 1925 causing problems in practice for intermediaries facilitating dealings in book entry based equitable entitlements to interests in investment securities.[1552] In light of this, it could be possible to argue that for intermediaries facilitating dealings in book entry based equitable entitlements to interests in crypto-tokens, the practical impact of section 53(1)(c) LPA 1925 is likely to be similarly limited.

17.42 Although we regard this as a reasonable point of view, we nevertheless consider any ongoing perceived uncertainty regarding the application and implications of section 53(1)(c) LPA 1925 to emerging and growing industries such as crypto-token markets as unsatisfactory. A perceived lack of legal clarity could disincentivise market participants in the crypto-token sector from drawing on the utility and flexibility of trusts for structuring crypto-token custody arrangements under the law of England and Wales.[1553] This may not be a merely theoretical concern. Commentators have noted that this ambiguity in relation to formalities law has had a direct impact on the development and location of financial markets infrastructure for Eurobonds. They

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[1550] H Liu, "Transfers of equitable interests in the digital asset world" [2022] *Journal of International Banking and Financial Law* 325, 329.

[1551] "Smart Legal Contracts – Advice to Government" (2022) para 3.90; H Liu, "Transfers of equitable interests in the digital asset world" [2022] *Journal of International Banking and Financial Law* 325, 328; See, generally, L L Fuller, "Consideration and Form" (1941) 41(5) *Columbia Law Review* 799.

[1552] Law Commission of England and Wales, "Intermediated securities: who owns your shares? A Scoping Paper" (2020) paras 7.54 and 7.56.

[1553] As we discuss in Chapter 16, trust-based custody structures can be beneficial for (and protective of the proprietary interests of) end-users in a number of different ways.

suggest that this, in part, explains why some major settlement institutions have chosen to be based outside the United Kingdom.[1554]

17.43 We therefore provisionally propose statutory law reform clarifying the scope and application of section 53(1)(c) LPA 1925 in connection with certain dealings in specified forms of equitable crypto-token entitlements.

17.44 In principle, we provisionally propose that there should be an express exclusion from section 53(1)(c) LPA 1925 of qualifying outright transfers[1555] of certain equitable entitlements to crypto-tokens. This would be in respect of those transfers represented by entries recorded in electronic ledger(s) that are subject to or capable of being subject to centralised discretionary control by a direct custodian acting in the ordinary course of business. The exclusion would cover entitlements recorded in both internal electronic ledgers and also external ledgers (for example, maintained in permissioned networks and/or through upgradable smart contracts), over which a professional custodian has the discretionary capacity to initiate, prevent, reverse, or rectify changes in entitlement balances. We propose that such an exception should apply to the extent that they are not already out of scope (whether on the basis of the arguments set out earlier in this chapter or otherwise).

17.45 By contrast, we think that a different approach is appropriate for equitable entitlements represented by crypto-tokens not recorded in account ledgers subject to professional, centralised discretionary control where the underlying or linked crypto-tokens are held by one or more persons acting as custodian. We consider that dealings in such entitlement-linked tokens should remain subject to section 53(1)(c) LPA 1925. However, we consider that the records and authentication processes maintained and utilised natively by the network in which such tokens are instantiated are already (or, if not, should be) capable of satisfying in full the provision's writing and signature requirements. Any perceived ambiguity in this respect could be eliminated by express statutory recognition that such records and authentication processes satisfy the formalities requirements.

17.46 As a further alternative to complete non-intervention and express statutory reform, we suggest clear, authoritative legal guidance either from the courts or in the form of non-binding guidance from a panel of industry experts, legal practitioners, academics, and judges. This would be an effective alternative solution that could be helpful in reducing any perceived uncertainty in this respect.

17.47 The intended effect of any proposed law reform (whether achieved through statutory reform, common-law development, or non-binding guidance-based means) would be clarificatory. It would be framed as "for the avoidance of doubt and to the extent necessary", so that existing arguments supporting the legal recognition of electronic communications and processes as satisfying formalities requirements remain available and unaffected.

[1554] Clifford Chance, "The treatment of cryptotokens at English law: back to the future" (2019) p 22: https://www.cliffordchance.com/briefings/2019/07/the_treatment_ofcryptotokensatenglishlaw.html.

[1555] Our position on the formalities applicable to grants of security interests is outlined separately in Chapter 18 para 18.81.

17.48 "Qualifying outright transfers" are transfers involving the full divestment of (equitable) title by the transferor or disponor of an equitable crypto-token entitlement and corresponding, causal acquisition of full title by a recipient transferee or disponee of the same or a causally-related crypto-token entitlement effected:

(1) where the entitlement is represented by a crypto-token, by a state change to the network in which the crypto-token is instantiated; and

(2) where the entitlement is represented by a book entry credit, by a book entry debit to the account of the transferor or disponor and a corresponding book entry credit to the account of the recipient transferee or disponee maintained in the internal electronic ledger(s) of one or more persons acting in the capacity of a crypto-token custodian.

17.49 The analysis above relates to crypto-tokens specifically, consistent with the scope of our current work. However, we acknowledge that our proposals may also be relevant to and of benefit beyond crypto-token markets, including in relation to transfers of intermediated securities.[1556] In our 2020 scoping paper we set out a list of possible targeted solutions that the Government could consider to increase legal certainty and confidence in intermediated securities. This list included law reform clarifying that the formalities requirements in section 53(1)(c) LPA 1925 did not apply to transfers in intermediated securities.[1557] In recognising the merits of and formulating substantive proposals for reform, we do not intend in any way to undermine the validity of existing arguments that market participants may currently be relying upon to justify the treatment of dealings in intermediated securities. As we discuss above, those arguments are that such dealings should be characterised as either falling outside of or alternatively satisfying through electronic communication and authentication processes the formality requirements of section 53(1)(c) LPA 1925. So our provisional conclusions and proposals are without prejudice to such arguments and are intended to be clarificatory, for the avoidance of doubt and only to the extent necessary to eliminate any present perceived ambiguity. As such, we frame our provisional proposals by reference to qualifying outright transfers (that is, certain types of transfers) and not by reference to the underlying asset being transferred. So our provisional proposals would be wide enough to apply to certain types of transfers in both the crypto-token markets and in relation to transfers of intermediated securities. Our consultation question below asks for consultees' views on this point.

17.50 It is important to note that the legal reforms proposed would only apply to a subset of trust-based crypto-token custody arrangements. Outside the arrangements and transactions specified, other forms of dealings in equitable entitlements to crypto-tokens would continue to be subject to the formalities requirements of section 53(1)(c) LPA 1925 in the form and to the extent they would otherwise apply. This would include, for instance, assignments of an equitable entitlement to a specified crypto-token NFT held on trust, that were effected "off chain" in connection with a traditional paper-based private family trust instrument. If such assignments were not represented by changes in credit entries in the internal account ledger of a professional crypto-

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[1556] Law Commission of England and Wales, "Intermediated securities: who owns your shares? A Scoping Paper" (2020) paras 7.51 to 7.52 and 7.56 to 7.63.

[1557] Above p 184.

token custodian they would need to comply with a standard, conventional interpretation of the writing and signature formalities requirements to be legally valid.[1558]

17.51 In making this provisional proposal, we take the view that section 53(1)(c) LPA 1925 is fundamentally directed at preventing the fraudulent assertion of illegitimate claims to beneficial entitlement. For crypto-tokens, we believe that this risk is adequately addressed for the transfer types specified above by the ledgers on which they would be settled (whether decentralised, external or professionally-maintained, centrally-controllable) and the associated transaction instructions by which they would be executed or initiated.

17.52 We acknowledge that within trust-based crypto-token custody arrangements a custodian could fraudulently deny recognition to valid beneficial entitlements. This risk is particularly acute where a custodian exercises complete or dominant control over updates to the relevant internal or (permissioned or upgradable smart contract-based) external ledger. However, we believe this threat is adequately controlled by the private law actions that holders of equitable entitlements are able to bring for breach of trust or contract, or in tort, in the event of improper action by their custodian trustee.[1559] Where the equitable entitlements constitute regulated financial products, or their safeguarding constitutes a regulated financial service, the risk may be further ameliorated by potential actions for breach of regulation by entitlement holders and/or regulatory supervisory bodies under applicable regulatory frameworks.

17.53 We are not persuaded that it would be desirable to insist on formalities *external* to the communications (i) recorded on the intermediated platform on the internal ledger of a professional custodian on which the book entry entitlements are recorded, or (ii) the network on which the tokenised entitlements are instantiated. Any potential resulting reductions in fraud risk would likely be outweighed by the negative impact that compliance with such requirements would have on the efficient operation and viability of crypto-token custody facilities structured as trusts under the law of England and Wales. It would also result in "on chain" transfers being subject to different validity requirements depending on whether they represented legal or equitable interests. This would create additional complexity for market participants and undermine the transactional integrity of crypto-token networks, without a sufficiently strong countervailing policy to justify such a change.

Formalities: options for reform

17.54 **Option 1:** One potential response to the issues set out above is to undertake no reform of section 53(1)(c) LPA 1925 on the grounds that the interpretation and application of the provision as currently drafted are sufficiently clear. It could be argued that legislative change would be of no practical benefit to crypto-token custodians, or indeed to other intermediated entitlement holding structures such as those used by custodians of indirectly held investment securities. Additionally, it could

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[1558] This is to ensure that the risk of the fraudulent assertion of illegitimate claims to beneficial entitlement is properly controlled and minimised, which is in our view, the fundamental purpose behind the formalities requirements of s 53(1)(c) LPA 1925.

[1559] See Chapter 19, from para 19.54.

be argued that the suggestion that legislative change was merited or desirable could in itself undermine existing legal certainty in this area.

17.55 **Option 2:** However, we provisionally conclude that certain changes and clarifications to formalities rules would provide greater certainty for crypto-token market participants utilising trusts under the law of England and Wales. To achieve this, we consider that statutory intervention would be preferable to an incremental evolution of the law primarily directed by the courts over time. There are various approaches to reform (which are not necessarily mutually exclusive and could be used in combination) that we think could be adopted:

(1) **Option 2(a):** Amending section 53(1)(c) LPA 1925 directly to incorporate:

(a) an express qualification that disapplies it to specified dealings in equitable entitlements; and

(b) an express recognition of various forms of electronic communication and records as satisfying the in writing and signature formalities.

Both revisions would be expressed as matters of general principle and not by reference to any particular category of assets; or

(2) **Option 2(b):** Introducing new statutory provisions that confirm the formality requirements for certain specified dealings in equitable entitlements undertaken through specified holding and transaction arrangements. For entitlements represented by entries in ledgers subject to centralised control by custodians acting in the course of business, the provisions could be modelled along equivalent rules developed more specifically for intermediated securities set out in the Geneva Convention on Substantive Rules for Intermediated Securities.[1560] For example, Articles 11(1) and 11(2) of the Geneva Convention state that acquisitions and dispositions of intermediated securities can be effected by authorised credits and debits to the securities accounts of the relevant parties maintained by their respective intermediary, with "no further step…necessary" for such dealings to be legally valid.[1561] Alongside provisions for entitlements in professionally operated, centrally-controlled ledgers, a corresponding set of rules could also be developed for dealings in other forms

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[1560] The 2009 Geneva Securities Convention is an international instrument which provides a legal framework for holding and transferring intermediated securities. It aims to harmonise the operation and outcomes of national laws, and to enhance the stability and cross-border compatibility of national financial markets. However, the Convention is not currently in force: https://www.unidroit.org/instruments/capital-markets/geneva-convention/. The approach proposed here would however, be expressed as matters of general principle and not by reference to any particular category of assets. The rule would therefore apply to qualifying entitlement holding and dealing structures irrespective of the underlying asset and could therefore encompass entitlements to crypto-tokens as well as investment securities.

[1561] A similar reform was proposed in the context of intermediated securities by CLLS, in their Response to the Joint Working Party of the City of London Law Society Company Law, Financial Law and Regulatory Law Committees to the Law Commission's Consultation on Intermediated Securities (8th November 2019) p 27: https://www.citysolicitors.org.uk/storage/2019/11/CLLS-Response-Intermediated-Securities-11-11-19.pdf.

of tokenised equitable entitlements, including those subject to decentralised ledgers.[1562]

17.56 **Option 3:** In the absence of express statutory recognition, we consider that the effect of this clarification could also be achieved through clear and authoritative legal guidance, developed incrementally (i) by the courts without reference to expert guidance, (ii) in the form of non-binding guidance from a panel of industry experts, legal practitioners, academics, and judges, or (iii) by the courts with reference to non-binding guidance from formally recognised industry panels.

17.57 On balance, our current preference is Option 2(a). This would enable the benefits of the statutory intervention to apply to dealings in objects of property rights of any type that raise similar issues or exhibit similar features to those discussed above in the context of crypto-tokens (including, for example, intermediated securities). However, we welcome input and comments from consultees as to the extent to which the issues identified in this section pose problems for trust-based dealings and arrangements in practice, and the form and scope of any related statutory reform.

Consultation Question 32.

17.58 We provisionally propose that clarification of the scope and application of section 53(1)(c) LPA 1925 would be beneficial for custodians and would help facilitate the broader adoption of trust law in structuring custody facilities, in relation to crypto-tokens specifically and/or to other asset classes and holding structures, including intermediated investment securities. Do you agree?

17.59 If you think that clarification of the scope and application of section 53(1)(c) LPA 1925 would be beneficial, what do you think would be the best way of achieving this? Please indicate which (if any) of the models suggested in the consultation paper would be appropriate, or otherwise outline any further alternatives that you think would be more practically effective and/or workable.

SHORTFALLS AND CRYPTO-TOKEN CUSTODIAN INSOLVENCY

17.60 Shortfalls occur when a custodian does not hold or have access to sufficient crypto-tokens or crypto-token entitlements to meet the aggregate claims of its users or customers. Shortfalls can arise unintentionally (on the part of the custodian), for example, as a result of a fraud or hack, or because of an administrative or operational error. Sometimes shortfalls can arise as a result of improper activity by the custodian. They can also happen as a result of activity consistent with the proper operation of the custody facility, such as following the exercise of a right of use over and subsequent lending of custodied crypto-tokens, either to a third party or through a DeFi platform.

[1562] Our proposals here are consistent with and draw on the analysis of reform options for section 53(1)(c) LPA 1925 that we previously considered in the context of intermediated securities: Law Commission of England and Wales "*Intermediated securities: who owns your shares? A Scoping Paper*" (2020) paras 7.56 to 7.63.

17.61 If the custodian is solvent at the time of any shortfall, the custodian may be under a legal obligation to make good or pay compensation in connection with the shortfall. The terms on which the custody facility is provided, and whether it is contractual only or based on a trust relationship, will determine the circumstances in and the extent to which this is the case. For purely contractual facilities these obligations will be governed by the express and implied terms of the relevant agreement(s),[1563] subject to any statutory or common law rules constraining or qualifying the effectiveness of any exclusion or limitation of liability clauses, discussed in Chapter 16.[1564]

17.62 Trust-based liabilities in connection with a shortfall can, to an extent, be controlled though liability exclusion or limitation clauses.[1565] However, some liabilities relate to the "irreducible core" content of trusteeship and cannot be excluded.[1566] These are liabilities arising because of a breach of a fiduciary duty of loyalty, or that constitute dishonesty in respect, or a wilful breach, of the trustee's duty of care or of other positive obligations under the terms of the trust.

17.63 If a shortfall occurs and the custodian enters insolvency proceedings, then the allocation of losses will again be dependent on the legal nature of the custody facility and the rights granted to users under it.[1567] If the facility is purely contractual, then users will have no proprietary rights of recourse to any specific crypto-tokens retained by the insolvent estate but will instead rank as general unsecured creditors.[1568]

17.64 For trust-based custody facilities, where crypto-tokens or crypto-token entitlements are held on an individually-allocated basis for each user, then a loss affecting any particular holding will be borne entirely by the user that is the beneficial owner of that holding.

17.65 However, where crypto-tokens or crypto-token entitlements are subject to a trust but held on an unallocated commingled basis for the benefit of multiple parties, there is some uncertainty as to the correct approach to apportioning any shortfall losses among such parties under the law of England and Wales.

17.66 For pools that are subject to substantial volumes and high frequency of transactional activity, the courts are likely to allocate losses among all affected participants on a proportionate (or *pro rata*) basis.[1569] This could be regarded as the "most practical and

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[1563] Under the law of England and Wales, custodians will ordinarily be characterised as performing a service, and will be subject to an implied obligation to carry out that service with reasonable skill and care (Supply of Goods and Services Act 1982, s 13).

[1564] See para 16.49.

[1565] See para 19.54.

[1566] *Armitage v Nurse* [1998] Ch 241, 253, by Millett LJ.

[1567] The Financial Services Compensation Scheme will not provide compensation in this context because claims against crypto-token custodians would not fall within its remit: see FCA Handbook Compensation Sourcebook ("COMP"), in particular COMP 5.2.

[1568] Kristin van Zwieten, *Goode on Principles of Corporate Insolvency Law* (5th Ed. 2018) paras 8-02 and 8-55.

[1569] M Yates, G Montague, *The Law of Global Custody* (4th Edition 2013) para 3.55. The *pro rata* approach was adopted by the New Zealand High Court to apportion shortfall losses remaining following the insolvency of a custodial crypto-token exchange in *Ruscoe v Cryptopia Limited (in liquidation)* [2020] NZHC 728 at [204].

least arbitrary approach",[1570] particularly where the application of traditional tracing rules to determine the appropriate distribution of losses would be unduly complex.[1571] It can also be justified as being aligned with the commercial expectations of users, as a reflection of their "common venture of holding securities in a pooled account and the common risk taken by the account holders as to the [custodian]'s integrity and solvency".[1572]

17.67 Nevertheless, in the absence of any express affirmation of a *pro rata* apportionment of shortfall losses, there remains the possibility that certain participants in a particular pool might try to claim that the use of tracing rules was correct and suitable in the circumstances. This could be used to justify shifting the burden of shortfall losses to or towards other participants rather than bearing the burden collectively. Potential alternative approaches to the allocation of shortfall losses include:

(1) The rule in *Clayton's Case*[1573] (or a "first in, first out") approach. Shortfall-generating withdrawals from pooled or commingled holdings accumulated through a series of deposits from different sources at different times will be treated as removing assets from the pool in the order in which they were deposited. Shortfall losses would therefore be disproportionately allocated to and concentrated among the earliest contributors to the pool.

(2) The "rolling charge" (or "North American") approach. Each shortfall-generating withdrawal from pooled or commingled holdings (accumulated through a series of deposits from different sources at different times) is considered individually. Unless unequivocally attributable to a particular depositor or source, each such withdrawal will be treated as a *pro rata* reduction of the deposits held at the moment immediately prior the relevant withdrawal is made. In *Barlow Clowes v Vaughan*,[1574] the Court of Appeal held that this approach was likely to "produce the most just result". However, the Court declined to apply it on the basis that it would have been disproportionality complex and costly to carry out the necessary calculations in the circumstances of that particular case.

17.68 Some academic commentators have argued that the approach to apportioning shortfall losses should depend on the nature of the equitable proprietary entitlements

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[1570] M Solinas, "Bitcoins in Wonderland: Lessons from the Cheshire Cat" [2019] 3 *Lloyd's Maritime and Commercial Law Quarterly* 433, 450. In the context of intermediated securities holdings trading activities in conventional financial markets, see Financial Markets Law Committee, "*Property Interests in Investment Securities*" (2004) p 11.

[1571] *Barlow Clowes International Ltd (in liq) v Vaughan* [1992] 4 All ER 22, 42, by Woolf LJ. For an overview of the different approaches to tracing that could apply as an alternative to a *pro rata* allocation principle, see B McFarlane, R Stevens "Interests in Securities – Practical Problems and Conceptual Solutions" in L Gullifer, J Payne, *Intermediated Securities – Legal Problems and Practical Issues* (2010) pp 41 to 43.

[1572] M Solinas, "Bitcoins in Wonderland: Lessons from the Cheshire Cat" 3 *Lloyd's Maritime and Commercial Law Quarterly* 433, 450. *Pearson v Lehman Brothers Finance SA* [2010] EWHC 2914 (Ch) at [244]. Where consistent with the commercial expectations of the parties, a *pro rata* allocation of shortfall risks could be supported on the basis of an implied term of the trust or services agreement governing the custody facility: L Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th Edition 2017) para 6-22.

[1573] (1816) 1 Mer 572.

[1574] [1992] 4 All ER 22, at 28, by Dillon LJ and at 35, by Woolf LJ.

held by affected users.[1575] For example, a pool contributor's entitlement could be characterised as a beneficial interest in specific crypto-tokens, forming part of an undivided bulk, but which due to their nature, do not have to be identified and allocated to establish the necessary subject matter certainty. For such an arrangement, these commentators suggest that traditional tracing rules should apply to determine a user's entitlements to remaining assets (as well as their ability to trace misdirected assets).

17.69 Alternatively, a pool contributor's entitlement could instead be characterised as a beneficial co-ownership interest in the whole pool. Sharing losses on a *pro rata* basis among pool contributors in proportion to their respective entitlements could then be regarded as a "natural function" of such a co-ownership arrangement.[1576]

17.70 Notwithstanding the above conceptual arguments, certain practitioners have questioned whether, in the context of indirectly held securities, the application of traditional tracing rules could "ever be both practical and proportionate", concluding that they are effectively unworkable.[1577] A similar conclusion could legitimately be drawn in relation to intermediary accounts for commingled crypto-token entitlements, particularly for pools subject to a high level of transactional activity by a substantial number of users.[1578]

17.71 Given the range of scenarios in which shortfalls could arise in relation to the operation of crypto-token custody, continued uncertainty as to the basis for apportioning shortfall losses is unhelpful. Where a custodian enters insolvency proceedings, this uncertainty could expose users to the risk of increased delays and heightened litigation costs in recovering their crypto-tokens through the insolvency process. This problem may become more pronounced over time. It could be compounded as the value and variety of assets held by and the operational complexity of crypto-token custody facilities continues to grow, to meet the more exacting demands of, and support deeper engagement in the crypto-token and cryptoasset sector by sophisticated market participants.

17.72 We provisionally conclude that law reform clarifying and simplifying the apportionment of shortfall losses arising out of commingled crypto-token holdings held on trust by an insolvent custodian would be beneficial.[1579] We do not believe that reform would

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[1575] B McFarlane, R Stevens "Interests in Securities – Practical Problems and Conceptual Solutions" in L Gullifer, J Payne, *Intermediated Securities – Legal Problems and Practical Issues* (2010) p 44.

[1576] V Dixon, "The Legal Nature of Intermediated Securities: An Insurmountable Obstacle to Legal Certainty?" in L Gullifer, J Payne, *Intermediation and Beyond* (2019) pp 81 and 83.

[1577] G Moss "Intermediated Securities: Issues Arising from Insolvency" in L Gullifer, J Payne, *Intermediated Securities – Legal Problems and Practical Issues* (2010) p 67.

[1578] Given the intermediated holding structures, this would likely remain true even though transactions which involve a change of state to underlying crypto-token systems are more readily traceable through forensic technical processes.

[1579] For our assessment of shortfalls arising in relation to holdings of intermediated securities see - Law Commission of England and Wales "*Intermediated securities: who owns your shares? A Scoping Paper*" (2020), Chapter 6. In that context we concluded that further statutory reform was unnecessary given the extensive regulatory regime and special insolvency regimes in place for various regulated financial institutions that both reduce the risk of shortfalls arising and provide for their efficient resolution in insolvency if they do.

necessarily be achieved within a reasonable timeframe if such changes were left for the courts to develop incrementally over time. Instead, we think that targeted statutory intervention would likely be more effective in providing the necessary certainty to support the development of innovative, efficient, and operationally robust custody infrastructure for crypto-token markets.[1580]

17.73 One potential option would be to model the reform on the relevant parts of the Investment Bank Special Administration Regulations 2011 (the "IB SARs") applicable to omnibus accounts. These provisions were introduced in response to the protracted delays experienced by clients of Lehman Brothers International (Europe), after the bank went into administration, in obtaining the return of cash and securities held for them on trust.

17.74 The IB SARs create a special administration regime for insolvent "investment banks".[1581] An administrator appointed under the IB SARs has three main statutory objectives, the first of which is to "ensure the return of client assets as soon as is reasonably practicable".[1582]

17.75 In support of this objective, where claims are made in the administration by clients to assets held by the investment bank in an omnibus (that is, a pooled multi-client) account, the IB SARs expressly direct that any shortfall of assets in that account that cannot be remedied will be borne by all such clients on a *pro rata* basis.[1583] The IB SARs therefore eliminate the risk of extended delays and increased litigation costs arising from clients arguing for alternative, non-proportionate shortfall loss apportionment schemes.

17.76 We provisionally consider that a similar statutory rule providing for *pro rata* apportionment of shortfall losses could be justified for and beneficial to the operation of crypto-token custodians (at least to the extent that the relevant safeguarding services are provided by the custodian acting in the course of business).

17.77 In reaching this provisional conclusion, we note that HM Treasury recently published a consultation proposing to amend the Financial Markets Infrastructure Special Administration Regime ("FMI SAR") and also presented a bill to Parliament setting out the legislation that will facilitate the necessary statutory changes.[1584] The objective of the proposed amendment would be to address the risks posed by the possible failure of a "Digital Settlement Asset" firm of systemic importance. "Digital Settlement Asset" (

[1580] M Solinas, "Bitcoins in Wonderland: Lessons from the Cheshire Cat" [2019] 3 *Lloyd's Maritime and Commercial Law Quarterly* 433, 449 to 450.

[1581] In broad terms, "investment banks" for these purposes are UK-incorporated institutions providing custody services to clients and authorised by the FCA to provide such services (potentially alongside other permissions granted for the provision of investment dealing and fund depository services). See Banking Act 2009, s 232 for the full definition.

[1582] Reg 12 Investment Bank Special Administration Regulations 2011. This is subject to the administrator's power (under Reg 11 Investment Bank Special Administration Regulations 2011) to set a bar date for the submission of ownership and secured recourse claims to client assets held by the investment bank.

[1583] Reg 12 Investment Bank Special Administration Regulations 2011.

[1584] HM Treasury, *Managing the failure of systemic digital settlement asset (including stablecoin) firms: Consultation* (May 2022). See also Schedule 6 (Digital Settlement Assets), Financial Services and Markets Bill 2022: https://publications.parliament.uk/pa/bills/cbill/58-03/0146/220146.pdf.

"DSA") refers to a subset of crypto-tokens that are used for payments and settlements. DSA includes those "stablecoin" crypto-tokens used as a means of payment that the Government intends to bring within the scope of established regulatory regimes for electronic money and payments.[1585] In addition to clarifying the application of the FMI SAR to "systemic DSA firms",[1586] HM Treasury also propose to amend the existing administration framework. The effect would be that alongside the existing objective of maintaining continuity of service, an additional objective of facilitating the return of funds or custody assets would apply to administrators.[1587]

17.78 We recognise that the application of existing Special Administration Regimes (or the creation of new, distinct Special Administration Regimes) to crypto-token custody arrangements requires further, detailed consideration which is out of the scope of this consultation paper. However, we provisionally conclude that as part of any such law reform, it would be useful to implement a general requirement for *pro rata* apportionment of shortfall losses that cannot be remedied following a custodian insolvency.[1588] We provisionally conclude that this would be a practically workable solution that would facilitate the return of user assets in a custodian insolvency without undue delay. It would also be conceptually consistent with the characterisation of beneficial interests in commingled holdings being co-ownership rights under an equitable tenancy in common.

17.79 Alternatively, more structured approaches to statutory reform could include:

(1) Limiting the *pro rata* shortfall allocation rule to commingled unallocated holdings that are or are expected to be the subject of a relatively high level of transactional activity. This could be achieved for example, by applying the rule only to crypto-token custodians that in addition to safeguarding and administering assets also actively facilitate (whether as agent and/or as principal) transactions in custodied crypto-tokens or crypto-token entitlements. Where transactional activity is not, or is not expected to be, substantial it could be argued that applying alternative shortfall loss allocation rules (such as the "rolling charge" approach) would not be impractical or excessively costly and could lead to a more just result.

[1585] HM Treasury, *Managing the failure of systemic digital settlement asset (including stablecoin) firms: Consultation* (May 2022) para 1.8 and *Response to the consultation and call for evidence* (April 2022).

[1586] "Systemic DSA firm" refers to systemic DSA payment systems and/or an operator of such a system or a DSA service provider of systemic importance. In the case of stablecoin, this might include — but is not limited to — the issuer of a stablecoin, a wallet, or a third-party service provider, which could we presume include a custodian: HM Treasury, *Managing the failure of systemic digital settlement asset (including stablecoin) firms: Consultation* (May 2022) para 1.8: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1079348/Stablecoin_FMISAR_Consultation.pdf.

[1587] Under this proposal, the Bank of England (after consultation with the Financial Conduct Authority where required) would be authorised to direct administrators on which objective should take precedence in any particular systemic DSA firm administration: HM Treasury, *Managing the failure of systemic digital settlement asset (including stablecoin) firms: Consultation* (May 2022) paras 2.9 to 2.11: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1079348/Stablecoin_FMISAR_Consultation.pdf.

[1588] Such shortfall arising in connection with crypto-tokens or crypto-token entitlements held on trust on a commingled unallocated basis for multiple users.

(2) Limiting the *pro rata* shortfall allocation rule to commingled unallocated holdings that should be properly characterised as co-ownership arrangements and not extending it to entitlements to specific crypto-tokens that are part of an undivided bulk. For the latter arrangements it could be argued that a *pro rata* rule would not be conceptually justified.[1589]

(3) Limiting the *pro rata* shortfall allocation rule to commingled unallocated holdings only to the extent that they do not constitute "house" assets that the custodian is beneficially entitled to. For such arrangements, it could be argued that shortfall losses should be borne first by the custodian before any residual deficit is apportioned among users. The allocation of losses to the custodian could either be generally applicable, irrespective of the reason for the shortfall, or perhaps only where due to any breach by the custodian of its trustee's duty of care, any fiduciary duty or any positive obligation under the terms of the trust and to the extent not covered by a valid trustee exemption clause.[1590]

17.80 We acknowledge that taking a more structured approach that limits the potential application of a *pro rata* shortfall allocation rule could in theory facilitate fairer, more just outcomes across a broader range of shortfall scenarios. However, such an approach would need to be balanced against the risk that a more complex statutory regime could lead to uncertainty and disputes over whether it is being applied correctly. This could have the unwelcome consequence of undermining the very reason for introducing a statutory loss allocation rule in the first place — namely, minimising litigation-related costs and delays in the return of trust assets following a crypto-token custodian insolvency. We therefore provisionally conclude that, on balance, a general *pro rata* shortfall allocation rule would be the better approach for any statutory intervention.

Consultation Question 33.

17.81 We provisionally propose that legislation should provide for a general *pro rata* shortfall allocation rule in respect of commingled unallocated holdings of crypto-tokens or crypto-token entitlements in a custodian insolvency. Do you agree?

LAW REFORM TO SUPPORT ALTERNATIVE LEGAL HOLDING STRUCTURES: BAILMENT

17.82 In our call for evidence, we invited comment on the legal and practical consequences of making digital assets possessable. We then went on to ask whether, if a digital

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[1589] For the reasons stated in Chapter 16 at paras 16.69 to 16.74, we think that this characterisation should be of limited or no application and that the co-ownership model should be the preferred conceptual approach for characterising trusts over commingled unallocated crypto-tokens or crypto-token entitlements. To the extent that the co-ownership characterisation would benefit from statutory recognition, this could be implemented alongside and would be complementary to the rules directing a *pro rata* apportionment of shortfall losses, proposed in this section.

[1590] A partial analogy can be drawn between this proposal and the approach to allocating shortfall losses taken in *Re Hallett's Estate* (1880) 13 Ch D 696.

asset were possessable, a bailment of digital assets would be a useful or a practical concept.[1591]

17.83 In Chapter 11, we explain why we consider that the concept of control is better suited than possession to crypto-tokens (and other data objects). As we suggest in Chapter 11, applying a concept of control to data objects, including crypto-tokens would, on the face of it, mean that legal principles that traditionally rely on concepts of possession would not automatically apply to crypto-tokens or other data objects. Below we consider whether there would be any substantive practical benefit to extending the law of bailment (which traditionally relies on the concept of possession) — or a bailment-type arrangement based on the concept of control — to crypto-tokens.

17.84 Under the current law, a bailment occurs where one person (the bailee) takes voluntary possession of a possessable (that is, tangible) object of property belonging to another (the bailor), usually for a specific purpose. The bailor retains the superior legal title to the object. At the end of the bailment, the bailee must either return the goods to the bailor or deal with them as the bailor directs.[1592] Examples of bailments include storage of the transferor's goods in the transferee's warehouse[1593] and a waiter taking a diner's coat for safekeeping at a restaurant.

17.85 Bailments can be undertaken gratuitously or for reward. Where a bailment relationship arises, the bailor is under a duty to take such care of the goods as is reasonable in the circumstances.[1594]

17.86 At present, it is not possible to create bailments of intangible assets (including crypto-tokens) as the permissible subject matter of bailments is limited to things in possession.[1595] It may nevertheless be possible in principle to extend the application of bailment to crypto-tokens and other data objects, or to develop an analogous concept based on transfer of control rather than of possession. We note, for example, that the US state of Wyoming has enacted laws which provide that digital assets held by qualified custodian intermediaries are held in a bailment relationship.[1596]

[1591] Call for evidence (2021) pp 10 and 18 to 19. As a further extension on the topic, at p 21 we also invited comment on the practical utility of permitting the grant of possessory security interests (in the form of pledges or liens) over digital assets. See Chapter 18 of this consultation paper for discussion of collateral arrangements in respect of crypto-tokens.

[1592] In a bailment at will, the bailor can take back possession at any time — the bailor retains an immediate *right* to possession, but the bailee has possession as a matter of fact. In a term bailment, the bailor's right is limited to that of the reversion. It is only once the term bailment comes to an end that the bailor can take back possession of the object.

[1593] *Coggs v Bernard* (1703) 2 Ld Raym 909.

[1594] *Volcafe Ltd v Compania Sud Americana de Vapores SA* [2018] UKSC 61 at [8] to [9], by Lord Sumption. M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) paras 12-004 to 12-005, 12-030.

[1595] UK Jurisdiction Taskforce "Legal statement on cryptoassets and smart contracts" (2019) paras 87 to 88. M Solinas, "Bitcoins in Wonderland: Lessons from the Cheshire Cat" [2019] 3 *Lloyd's Maritime and Commercial Law Quarterly* 433, 448. Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd Ed 2021) para 12-008.

[1596] Senate File 0125 § 29-104(d).

17.87 However, developing and formulating a specific law of bailment or "quasi-bailment"[1597] encompassing crypto-tokens could face conceptual challenges. For example, technical complications could arise due to the nature of how transactions in certain crypto-tokens are characterised as a matter of law. It could be argued that bailment at its core involves a transfer or delivery of possession of an object that retains its identity unchanged throughout the transfer or delivery process. As discussed from paragraph 12.10, transfers of crypto-tokens are more properly understood as transmissions of value, involving the extinction of a crypto-token by the disposing party and the creation of a new, causally-related crypto-token acquired by the receiving party.[1598] Nevertheless, where a transmission characterisation is appropriate[1599] then a (quasi-)bailment may still be supportable in principle on the alternative basis that bailment is fundamentally about the imposition of a set of duties on the bailee regardless of whether the object held is identical to the object disposed of.[1600]

17.88 The technical obstacles to the formulation of a bailment concept covering crypto-tokens could therefore potentially be overcome. However, there would still remain the question of whether any such extension or reform of the law would be of substantive practical benefit to users of or participants in markets for crypto-tokens.

17.89 On this point of practical benefit, there was no clear consensus among consultees to our call for evidence. Comments in favour of and opposed to recognising bailments of crypto-tokens were fairly evenly split, with a slight majority being against any change in the current law.[1601]

17.90 Most consultees in favour focused on bailment as a form of possessory security in the context of pledge. We deal with these points in Chapter 18 collateral arrangements. Norton Rose Fulbright observed that "the arrangements for custody and escrow of digital assets are still being developed and bailment could provide a practical solution in many cases".

17.91 Consultees provided a range of examples of situations in which, if amenable to possession, digital assets could be the subject matter of a bailment relationship. It is worth noting that some consultees provided such examples with the explicit caveat that they nevertheless did not recommend that digital assets be made capable of possession.

[1597] H Liu, L Gullifer and H Chong, "Client-intermediary relations in the crypto-asset world" (2020) University of Cambridge Faculty of Law Research Paper No 18/2021 p 7.

[1598] The extent to which crypto-token transactions should be characterised at law as "extinction and creation" transmissions is explored in Chapter 12.

[1599] And/or where the transaction mechanism involves the transferred object being received in modified form as a result of the transfer process.

[1600] H Liu, L Gullifer and H Chong, "Client-intermediary relations in the crypto-asset world" (2020) University of Cambridge Faculty of Law Research Paper No 18/2021 p 8.

[1601] Overall, and broadly speaking, nine consultees suggested that bailment would be a useful concept to employ in the digital asset space; eleven consultees said that it would not be useful.

17.92 The Digital Alliance Institute for Digital Financial Research discussed how a bailment-based security arrangement could operate in a decentralised finance context:

> In DeFi lending applications, such as MakerDAO, the debtor, acting as a bailor, would confer an amount of digital assets under their ownership as collaterals to be possessed by the lending network, in order to acquire a loan.

17.93 The Centre for Commercial Law at the University of Aberdeen suggested that a bailment analysis could be applicable to the relationship between the ultimate owners of digital assets and third-party intermediaries such as a digital asset wallet provider.[1602] The Financial Markets Law Committee ("FMLC") also gave the example of a bailment arising between a validator and the owner of a digital asset, in the context of staking. They explained:

> Staking occurs when digital asset owners in a DLT system perform the service of validating transactions alongside locking down some of their assets in the protocol, for an agreed period of time. The locked assets are used to achieve consensus and ensure honest validation. In return for their participation, these "validators" are rewarded with new digital assets from the network but a DLT system may decrease ("slash") a validator's stake for dishonest or malicious behaviour. To avoid dealing with the requirements that DLT systems place on validators, owners of the digital assets may opt to delegate their digital assets to a validator running a staking pool, who in turn will share the rewards with their delegators. This arrangement is typically set up and administered by smart contracts automatically but the underlying legal relationship might be best characterised as one of bailment.

17.94 In contrast to these more formal or structured bailment relationships, Professor Tettenborn observed that the bailment of a digital asset could arise more informally — for example, where "an owner O went abroad for a time and left the means of access to a digital asset in the hands of a friend or relative B to operate on his behalf".

17.95 The FMLC, who did not think bailment would be a useful concept in this context, commented:

> With the exception of staking, it is hard to imagine a useful or practical application where … bailment would apply to digital assets.

17.96 Relatedly, Alfonso Delgado and Amila Kulasinghe,[1603] in their joint response, said that an expansion of the law of bailment could lead to uncertainty and could disrupt the level of standardisation across the intermediated crypto-token custody market. They said that:

> given the availability and use of (as well as the familiarity that market participants with experience of mainstream financial markets custody have for deploying) trusts, expanding the law of bailment could also likely lead to greater variation and reduced

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[1602] In their response to our call for evidence, Professor Fox and Professor Gullifer suggested that it was possible to analyse these types of relationships as bailments, but that the preferable analysis would be as a trust relationship.

[1603] Amila Kulasinghe has since joined the Law Commission on a part-time basis and has worked on this consultation paper.

standardisation in legal frameworks for intermediated [crypto-token] custody market-wide, resulting in a lack of clarity and increased confusion for end-users in understanding their legal rights and obligations, particularly when engaging with multiple intermediaries for trading and safeguarding activities.

On balance, we would therefore argue against any expansion of the law of bailment to encompass [crypto-token] holdings at this stage of the industry's development.

17.97 Furthermore, some academic commentators have argued that any extension of bailment to crypto-tokens would be unnecessary. As discussed below, there are other widely-used and well-established legal constructs that can be and are being used to structure a variety of robust and flexible frameworks for holding and safeguarding crypto-token entitlements on behalf of others.

17.98 The principal incidents of the bailment relationship that make it useful for structuring property-holding arrangements are the bailee's duty of care and the bailee's right to sue third parties for deliberately or negligently interfering with the relevant property. However, substantively or functionally similar duties and remedies can effectively be replicated through trusts and/or in contract.[1604] Additionally, trusts and contract have evolved into flexible and versatile tools for establishing a variety of asset holding frameworks, particularly in the commercial context. As outlined in Chapter 16, these include omnibus accounts holding property on a commingled basis for multiple parties and the potential incorporation into such arrangements of a right of use. The circumstances in which similar facilities and features could be consistent with a bailment relationship is less clear and has been subject to comparatively limited development and consideration by the courts.[1605]

17.99 Even in the absence of (or prior to) an express declaration, trusts over custody facilities for crypto-token entitlements can be and have been recognised and upheld where the "three certainties" have been satisfied.[1606] Consequently, we do not regard the expansion of the law of bailment to crypto-tokens as necessary to provide users of these facilities with reliable and effective proprietary claims that would take priority over unsecured creditors in the event of a custodian insolvency.[1607]

[1604] H Liu, L Gullifer and H Chong, "Client-intermediary relations in the crypto-asset world" (2020) University of Cambridge Faculty of Law Research Paper No 18/2021 pp 13 to 14. This point was also made by Professors Fox and Gullifer in their response to our call for evidence.

[1605] Although the position is uncertain, bailments over crypto-tokens held in omnibus accounts (whether pooled solely with the assets of other customers or whether commingled with intermediary assets) and rights to the return of equivalent assets, could potentially be supportable by analogy with existing principle. See for example *Glencore International v Metro Trading International* [2001] 1 Lloyd's Rep 284 at [154] to [155]; A Burrows, *Principles of English Commercial Law* (2016) para 7.14). For problems as to the validity of a right of use in the context of bailment *see The South Australian Insurance Co v Randell* (1869) LR 3 PC 101, as discussed in M Bridge, L Gullifer, K Low, G McMeel, *The Law of Personal Property* (3rd ed 2021) para 12-022.

[1606] *Ruscoe v Cryptopia (in liquidation)* [2020] NZHC 728 at [139] and [181]. The "three certainties" required to establish an effective trust under the general law are certainty of intention, subject matter and object and were first set out in *Knight v Knight* (1840) 49 ER 58. We discuss the "three certainties" in more detail in Chapter 16 from para 16.56.

[1607] We therefore take a different view on this point to that expressed in N Palmer, *Palmer on Bailment* (3rd ed 2009) para 30-031.

17.100 In summary we provisionally conclude that there is at present no clear need for law reform extending or developing an analogous concept to bailment for application to crypto-tokens. This is consistent with our provisional conclusion in respect of possessory securities, discussed in Chapter 18.

17.101 We believe that the private law concepts of trust and contract already provide an adequate legal foundation for a range of crypto-token custody models and have sufficient capacity to support continued user engagement with and innovation in crypto-token and cryptoasset markets.

17.102 Nevertheless, as the crypto-token and cryptoasset markets evolve, there might be good reasons for developing a legal mechanism that allows for the imposition of legal duties on a party without the need for a trust relationship to arise and in the absence of a contract. Examples of where we consider that such a legal mechanism might prove helpful include in the context of certain staking arrangements, certain "locking and minting" facilities, such as bridging and in the context of the provision of liquidity to automated market maker pools. However, we recognise that the current law of bailment is not well-developed in respect of these types of arrangement and that market participants are unlikely to have created their legal structures with the concept of bailment in mind. For that reason, our question below includes a request for consultees to provide further detail and feedback on these types of structure.

Consultation Question 34.

17.103 We provisionally conclude that extending bailment to crypto-tokens, or the creation of an analogous concept based on control, is not necessary at this time. Do you agree?

If not, please provide specific examples of market structures or platforms that would benefit from being arranged as bailments, that could not be effectively structured using the trust and/or contract frameworks currently available.

Chapter 18: Crypto-token collateral arrangements

INTRODUCTION

18.1 As the value of various crypto-tokens has risen, there has been increased demand from market participants for services and applications that facilitate a broader range of methods for extracting value from crypto-token holdings that do not involve their outright sale. This has led to the emergence of businesses and platforms that enable the extension of credit secured or covered by crypto-token collateral arrangements.

18.2 This chapter refers to and uses examples of collateral arrangements in respect of crypto-tokens rather than data objects more generally. This is, in general, because crypto-tokens are the principal type of data object for which such collateral arrangements have developed in the market. However, we consider that the analysis contained in this chapter is likely to be applicable to data objects more broadly (to the extent that they utilise the same or similar underlying technology as crypto-tokens).

18.3 At a high level, a collateral arrangement involves granting recourse to certain specified property or pools of property to secure or otherwise cover a payment obligation or the performance of an undertaking.[1608] Collateral arrangements in crypto-token markets can help to extract value from otherwise underutilised assets. They arguably also have the potential to support increased market efficiency and stability by improving liquidity and more effective management of counterparty credit risk. However, for them to achieve their full potential it is important that the parties to these arrangements have confidence in their legal reliability and predictability.

18.4 Crypto-token collateral arrangements can take a diverse array of forms, both in relation to the commercial terms on which financing can be obtained and the practical arrangements under which crypto-token collateral is controlled. This diversity reflects both the particular financial risks associated with various crypto-tokens, the markets in which they are traded and, more recently, the technical capabilities of the underlying networks on which these tokens are instantiated.

The structure of this chapter

18.5 In this chapter, we look at the options for granting security in respect of crypto-tokens. First, we consider the applicability of common law concepts including title transfer and possessory and non-possessory security arrangements.

18.6 Second, we consider the extent to which the current statutory scheme for financial collateral arrangements (the Financial Collateral Arrangements (No 2) Regulations 2003 (the "**FCAR**s")[1609] could or should be applied effectively to crypto-tokens.

[1608] L Gullifer "What should we do about financial collateral?" [2012] 65 *Current Legal Problems* 377, 378: "The point of collateral is to protect A against credit risk relating to B.... It does this by acquiring a proprietary interest in assets, so that it has a right to pay itself out of the value of those assets, despite the insolvency of B."

[1609] SI 2003 No 3226.

18.7 Third, we begin to consider whether it would be desirable to develop bespoke statutory provisions designed specifically for collateral arrangements in respect of crypto-tokens. However, this would be a significant piece of work which is beyond the scope of this consultation paper. Rather than make provisional proposals for this, we merely highlight some issues for further consideration.

Centralised finance and decentralised finance

18.8 Financing facilities backed by crypto-token collateral can be subdivided into two broad categories.

18.9 First, lending arrangements made between identifiable persons that directly manage the establishment of credit facilities, the creation and servicing of loans and/or the custody of collateral using conventional operational processes. These arrangements bear many similarities to those used currently by intermediaries in mainstream financial markets and by traditional credit institutions such as banks when extending loans secured by investment securities, bank account cash balances and real-world assets. In crypto-token and cryptoasset[1610] markets, this form of lending is often referred to as "CeFi" or "Centralised Finance", highlighting the dependence of such facilities on traditional intermediaries as direct providers of credit and/or custody for the underlying collateral.[1611]

18.10 Second, an alternative model has recently emerged that relies upon the functionalities of crypto-token networks themselves to automate certain processes that replicate the substantive economic effect of collateralised loans. This category of lending facilities is one of the core forms of "DeFi", which is a "general term for decentrali[s]ed applications (Dapps) providing financial services on a blockchain settlement layer, including payments, lending, trading, investments, insurance, and asset management."[1612] The DeFi sector overall, and lending platforms in particular, have undergone rapid growth, with the total value locked across the relevant protocols rising from approximately $18 billion and $4 billion respectively at the beginning of 2021 to $83 billion and $18 billion as of mid-July 2022, in the week prior to the publication of this Consultation. DeFi has been a major contributing factor in driving broader adoption of new applications across crypto-token and cryptoasset markets.[1613]

[1610] We intentionally use the term cryptoasset here to include both crypto-tokens and those crypto-tokens linked to things external to crypto-token systems.

[1611] Examples of CeFi Lending Platforms include Nexo (https://nexo.io/.) and BlockFi (https://blockfi.com/.).

[1612] Wharton Blockchain and Digital Asset Project, "DeFi Beyond the Hype: The Emerging World of Decentralized Finance" (2021) p 2: https://wifpr.wharton.upenn.edu/wp-content/uploads/2021/05/DeFi-Beyond-the-Hype.pdf. The authors of the report identify the following as distinguishing characteristics of DeFi applications: 1. "Financial Services"; 2. "Trust-minimized operation and settlement"; 3. "Non-custodial design"; and 4. "Open, programmable, and composable architecture". See also our discussion in relation to DeFi from para 18.85.

[1613] See, for example: https://www.theblockcrypto.com/data/decentralized-finance/total-value-locked-tvl.

CRYPTO-TOKEN COLLATERAL ARRANGEMENT STRUCTURING OPTIONS UNDER THE GENERAL LAW

18.11 In general, crypto-token collateral arrangements can be structured either on a title transfer basis or as a security interest.

Title transfer

18.12 Under a title transfer facility, the collateral provider transfers in full its interest in the collateral assets to the collateral taker to secure or cover certain specified obligations owed to the collateral taker. The collateral taker undertakes to transfer the full interest in the asset back (or as is more typically the case, to transfer assets equivalent to the collateral assets received) to the collateral provider once the obligations secured or covered have been settled in full.

18.13 Title transfer arrangements can be entered into in respect of any object of personal property rights, whether tangible or intangible. There is therefore no obvious reason why title transfer arrangements could not be used in relation to crypto-tokens or to contractual or equitable entitlements to crypto-tokens held by an intermediary on behalf of the collateral provider.

18.14 Title transfer arrangements have a number of beneficial features for the collateral taker in particular.

(1) As the collateral taker obtains (superior) legal title to the collateral assets it is free to use them for its own purposes including, for example, selling them to third parties to earn an additional return.

(2) There are no registration-based perfection[1614] requirements such as could otherwise apply to an equivalent arrangement structured as a security interest.[1615]

(3) In the event of a default, the collateral taker can retain its legal title to the collateral assets (and account to the collateral provider for any surplus value) rather than sell them whereas, as discussed below, sale is necessary in the case of a charge.[1616] This can be particularly useful for crypto-token collateral as pricing volatility and limited liquidity may render the sale of collateral difficult or ineffective as a mechanism for realising its full market value.

(4) Collateral management procedures such as granting the collateral provider collateral excess withdrawal and substitution rights can easily be

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[1614] Perfection refers to steps required by statute in various contexts to give publicity to security interests in assets owned by another person to ensure their effectiveness against competing third party claims. Failure to comply with these steps results in the interests being void in the event of the collateral provider becoming subject to insolvency proceedings. See eg Companies Act 2006 Part 25.

[1615] However, to the extent that the title transfer arrangement involves the disposition of equitable entitlements to assets or the legal assignment of choses in action then statutory formalities for the valid execution of such transfers under s 53(1)(c) and s 136 of the Law of Property Act 1925 respectively may apply.

[1616] Discussed below at para 18.22(5).

accommodated without risk of compromising the legal efficacy, characterisation, or validity of the arrangement.

18.15 Despite their utility and versatility, title transfer arrangements have one significant deficiency: the collateral provider has only personal contractual rights to the return or transfer of equivalent collateral assets. The collateral provider is therefore exposed to credit risk of the collateral taker. In the event of the collateral taker entering insolvency proceedings, the collateral provider would only have an unsecured claim for any amount by which the value of the collateral assets transferred exceeded the value of the obligations secured.[1617] The possibility of this unsecured surplus exposure arising is perhaps greater for crypto-tokens than for many other assets due to their comparatively high volatility in market price and liquidity. Such an unsecured surplus exposure could still arise (although may be mitigated) under two-way title transfer collateral providing arrangements that are actively managed through regular exposure calculations and the marking-to-market[1618] of collateral holdings.

18.16 Therefore, we consider that it is already possible to enter into title transfer collateral arrangements in relation to crypto-tokens, and that such arrangements are likely to offer significant benefits to collateral takers. Nevertheless, given the risks in relation to such title transfer collateral arrangements that we briefly outline above, we expect that market participants are also likely to seek alternative (or supplementary) structuring arrangements for the provision of collateral.

Consultation Question 35.

18.17 We provisionally conclude that crypto-tokens, as objects of personal property rights, can be the subject of title transfer collateral arrangements without the need for specific law reform to provide for this. Do you agree?

Security interests

18.18 Alternatively, crypto-token collateral arrangements can be structured using security interests. In *Re Cosslett (Contractors) Ltd*, Lord Justice Millett (as he then was) helpfully summarised the four forms of consensual security:[1619]

> There are only four kinds of consensual security known to English law: (i) pledge; (ii) contractual lien; (iii) equitable charge and (iv) mortgage. A pledge and a contractual lien both depend on the delivery of possession to the creditor. The difference between them is that in the case of a pledge the owner delivers possession to the creditor as security, whereas in the case of a lien the creditor retains possession of goods previously delivered to him for some other purpose. Neither a mortgage nor a charge depends on the delivery of possession. The difference between them is that

[1617] See L Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th ed 2017) para 6-37.

[1618] Mark-to-market or fair value accounting is accounting for the "fair value" of an asset or liability based on the current market price, or the price for similar assets and liabilities, or based on another objectively assessed "fair" value.

[1619] [1998] 1 Ch 495, 508.

a mortgage involves a transfer of legal or equitable ownership to the creditor, whereas an equitable charge does not.

Non-possessory security arrangements

18.19 A mortgage is a transfer of ownership of an asset by way of security upon the express or implied condition that ownership will be transferred back to the collateral provider when the obligation secured has been settled.[1620] Unlike with an outright title transfer, as described above, the collateral provider under a mortgage retains the equity of redemption. This means that they have an (equitable) proprietary right to the return of the asset on the satisfaction of the relevant obligation, as opposed to a mere contractual right to the value of that asset.

18.20 A charge does not involve the transfer of ownership but constitutes a specifically enforceable right, created either by trust or by contract, to have recourse to a designated asset or class of assets to discharge a specified debt. The right of recourse is satisfied by the exercise of a power of sale and out of the resulting proceeds realised.

18.21 Consequently, non-possessory security interests are potentially useful to crypto-token collateral providers who are concerned about managing and minimising their exposure to collateral takers' credit risk. This may be particularly important where the matching of the value of crypto-tokens offered as collateral and the value of the obligations they secure may be volatile and uncertain (perhaps due to market risk, liquidity and/or volatility issues). Furthermore, mortgages and charges are versatile and can be granted over entitlements to an unallocated part of an identified bulk of intangible fungible assets. Since there is no need to transfer possession to the creditor, they can be validly granted over assets that are subject to holding arrangements that may vary over time and that may involve the participation of multiple parties and even automated processes.

18.22 There are however some features of non-possessory security interests that might limit their appeal to participants in crypto-token collateral arrangements.

(1) They may in certain circumstances require compliance with statutory formalities to be validly executed.[1621]

(2) Where the grantor is a UK-registered company or limited liability partnership they are generally subject to public registration-based perfection requirements.[1622]

[1620] *Santley v Wilde* [1899] 2 Ch 474; *Maugham v Sharpe* (1864) 17 CB NS 443.

[1621] An equitable mortgage of collateral comprising of equitable entitlements to crypto-tokens (whether in book entry or tokenised form) would constitute a disposition of a subsisting equitable interest for the purposes of the Law of Property Act 1925, s 53(1)(c). It would therefore need to be "in writing signed" by or on behalf of the mortgagor to satisfy the formalities requirement imposed by the Law of Property Act 1925, s 53(1)(c). However, this requirement does not apply to charges since they involve the creation of new equitable interests and not therefore dispositions of existing ones: M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) paras 16-054, 16-067 and 16-136; L Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th ed 2017) para 1-55.

[1622] Companies Act 2006, s 859A.

(3) If non-possessory security interests are structured to incorporate common collateral management techniques such as granting the security provider the right to withdraw excess or effect a substitution of security collateral, the security will very likely be characterised as a floating charge. This type of security interest is subject to various insolvency rules that limit their validity, prevent their rapid enforcement if the security provider becomes subject to insolvency proceedings, and diminish their realisable value to the collateral provider by subordinating its claim to those of certain preferential creditors.[1623]

(4) There is a potential residual risk that the legal efficacy of rights of use[1624] could be challenged as constituting a "clog on the equity of redemption".[1625] This could undermine the legal certainty of the collateral arrangement, disincentivising market participants from structuring their affairs to include such flexibility in the rights of use.

(5) It is not possible to enforce security rights under a charge other than by the exercise of a power of sale. As noted above, this may be disadvantageous in the context of crypto-markets experiencing periods of price volatility and uncertain liquidity, particularly for arrangements of size. Appropriation is regarded as being in effect a sale by the mortgagee or chargee to itself and is not a permissible mode of enforcement, even if undertaken at full market value.[1626] Mortgagees are potentially able to achieve a similar end result to appropriation through the remedy of foreclosure, but this is often subject to lengthy delays as it cannot be enforced without a court order.[1627]

18.23 Further, in response to our call for evidence, both Linklaters and the Financial Markets Law Committee ("FMLC") highlighted certain practical issues that parties using mortgages and charges may encounter. Linklaters observed that a mortgage "under which the mortgagee takes 'title' to the [crypto-token] … will expose the mortgagor to the practical risk of misappropriation by the mortgagee". Similarly, a charge "under which the chargor remains in effective control of the [crypto-token] … will expose the charge to misapplication of the [crypto-token] by the chargor". They said that it was therefore "customary to immobilise the [crypto-token] with a custodian under a triparty arrangement" — effectively to put in place an arrangement under which the custodian takes negative control of it. Immobilising a crypto-token with a custodian in this way would reduce the optionality for collateral providers to structure their collateral

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1623 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) paras 16-054, 16-067, 16-085.

1624 Which involve the collateral taker taking full title to assets for its own use subject to an obligation to return equivalent assets to the security.

1625 Broadly, there is a rule prohibiting "clogs" on the equity of redemption. See L Gullifer "What should we do about financial collateral?" [2012] 65 *Current Legal Problems* 377, 394 to 395. Despite this risk, the incorporation of rights of use into collateral arrangements based on non-possessory security interests has been an established and widespread practice by financing intermediaries (such as the prime brokerage divisions of investment banks) operating in mainstream financial markets for several years.

1626 *Hodson v Deans* [1903] 2 Law Reports, Chancery Division 647. *Farrar v Farrars Ltd* [1888] 40 Law Reports, Chancery Division 395.

1627 M Bridge, L Gullifer, K Low and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 16-051.

arrangements such that they can continue to use the collateral in some way during the period of the collateral arrangement.[1628]

18.24 Relatedly, the FMLC discussed the additional practical problems of ensuring that a security interest is "adequately notified to third parties to prevent unlawful transfers". They drew attention to the point set out above that mortgages [involving tangible assets] "typically allow the mortgagor to retain some control over the asset" and that mortgages of real property (land) are "recorded on a public register".[1629] In contrast, there may be problems in ensuring that third parties are adequately notified about the existence of a security interest in a crypto-token. However, they also noted in respect of this practical issue that "if there were suitable means of imposing actual or constructive notice" on third parties, then the "flexibility" of devices like the equitable charge "may remove the need for the creation of a mechanism for possessory security to arise".

18.25 We recognise that there are a number of practical and commercial issues with the desirability of certain non-possessory security arrangements for crypto-tokens. However, we consider that these are, in general, standard commercial considerations for market participants which are not necessarily limited to crypto-token or cryptoasset markets. We do not think, at this time at least, that anything further is required to facilitate the grant of non-possessory security interests in respect of crypto-tokens. However, we discuss from paragraph 18.81 how there may be good reasons to develop the law in relation to collateral arrangements in respect of crypto-tokens to help reduce the effect of some of the limitations we discuss above.

Consultation Question 36.

18.26 We provisionally conclude that non-possessory securities can be satisfactorily granted in respect of crypto-tokens without the need for law reform. Do you agree?

Possessory security arrangements

18.27 As the name suggests, under a possessory security arrangement, the party taking security has or will take possession of the assets provided as security. Pledges and liens are possessory security arrangements.

18.28 Under the current law, a pledge is a security interest created by the pledgor's delivery of possession of an asset to the pledgee as security for the performance of an obligation owed by the pledgor.[1630] A pledge is a type of bailment. The pledgee is

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[1628] For this reason, tri-party arrangements in mainstream markets routinely do not provide for full immobilisation of assets, but instead involve sophisticated collateral substitution (often referred to as "collateral optimisation") facilities and other arrangements that permit excess withdrawal and other access rights to collateral providers. The downside to these types of arrangement however is that they render the arrangement more likely to be characterised as a floating security interest, which diminishes the utility and realisable value of the collateral facility as a credit risk management device (unless it falls within the protective scope of the FCARs (discussed below)).

[1629] S 9 Land Registration Rules 2003, SI 2003 No 1417.

[1630] M Bridge, *Personal Property Law* (4th ed 2015) p 277.

entitled to retain possession of the pledged assets until the secured obligation has been performed. The pledgee also has the right to sell the pledged assets in the event of the pledgor's default, and to retain the proceeds to the extent necessary to satisfy the unperformed obligation.[1631]

18.29 A lien is a right to retain possession of a thing until a claim or debt has been satisfied. Liens may arise by operation of law, by statute or under a contract between the parties.[1632] Liens are however, of limited effectiveness as credit risk management tools or devices for obtaining credit on a secured basis since they do not provide any right to realise or appropriate the value inherent in the detained assets in the event of a debtor default.

18.30 While things regarded as intangible cannot be possessed as a matter of current law, there is a question as to how those things that fall within our proposed third category of personal property should be treated in the context of possessory security arrangements.

18.31 Given the drawbacks in respect of non-possessory security interests that we describe at paragraph 18.22 above, there may be merit in considering either:

(1) an extension of the application of possessory security interests to crypto-tokens and other data objects; or

(2) the development of an analogous control-based[1633] security interest.

18.32 For the reasons outlined in Chapter 11, we do not propose that data objects should be capable in general of being possessed, or that they should be things in possession. We are instead proposing the explicit recognition of a third category of personal property and propose the development of a concept of control that could play an analogous role to that of possession for tangible objects. We think, and stakeholders have told us, that control would be responsive to the particular features and characteristics of data objects as a distinct and evolving asset class. As we do not consider data objects to be possessable, it is not possible for them to benefit directly and automatically from the array of consequences that their possessability would otherwise entail, including the availability and application of existing possessory security arrangements.

18.33 It would, however be possible to develop a new (or analogous) form of security interest for data objects, modelled on the pledge, but founded on a transfer of (exclusive) factual control by way of security from "pledgor" to "pledgee". That is, the debtor would transfer control of the data object to the creditor.

Possessory security arrangements may be useful

18.34 In response to our call for evidence, several consultees said that recognising that data objects could be the subject matter of possessory, or analogous, security

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[1631] L Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th ed 2017) paras 1-47 to 1-48. A pledgee is not entitled to enforce their interest by way of foreclosure: *Carter v Wake* (1877) 4 Ch D 605.

[1632] M Bridge, L Gullifer, K Low and GMcMeel, *The Law of Personal Property* (3rd ed 2021) para 16-027.

[1633] Utilising the proposed concept of control that we outline in Chapter 11.

arrangements might be a useful or positive development for the law. For example, Norton Rose Fulbright said:

> Attribution of possession or an analogous concept to [crypto-tokens] would enable a more nuanced approach to security, although grant of effective security will always be limited by the underlying nature of [crypto-tokens].

18.35 The Association for Financial Markets in Europe suggested that certain forms of possessory security were more suited to liquid marketplaces. They said, in the context of a discussion of investment securities, that:

> if [the custodian's lien] cannot be relied upon, as it was in the days when ink and paper were the preferred tools for recording entitlements, then the alternatives provided through the … Financial Collateral Regulations or company security law in the UK (e.g. charges which are not exempted under the Financial Collateral Regulations) are burdensome and impractical in fast-moving markets.

18.36 The FMLC referred to the possibility that possessory security could give borrowers more access to finance and simplify the process of granting security, albeit with some attendant drawbacks. They said:

> To the extent that a simple means of granting security analogous to pawning could be created, it would create a means for borrowers to access a wider pool of potential lenders and remove complexity from taking security. However, the burdens that possessory security could place on both the security beneficiary, through its duty of care while the asset is in its possession, and the security provider, in terms of ceasing to have the asset available to it, may make it an unattractive proposition.

Potential issues with taking possessory security over data objects

18.37 Conversely, other consultees raised a number of potential issues with the taking of possessory security over a data object. These included the inapplicability of possessory security mechanisms to data objects, the lack of any practical benefit, and the difficult policy questions to which the publicity and registration of security interests would give rise.

18.38 Some stakeholders referred to a lack of any practical benefit to possessory-type security arrangements over non-possessory security arrangements. For example, Professor Sheehan said:

> I am not sure that in policy terms there is much advantage to being able to pledge a [crypto-token] as opposed to charging it – what practical benefit does a lender get from being a pledgee that he does not from being a chargee?

18.39 The "chief benefit" identified by Professor Fox and Professor Gullifer in their joint response, "would be that a pledge does not have to be registered in the company charges register". This, however, raises difficult policy issues concerning publicity and registration requirements, as well as the applicability of the FCARs (discussed below). As noted by Professor Fox and Professor Gullifer:

> [The fact that a pledge does not have to be registered in the company charges register] is a benefit to the secured creditor but not necessarily to the wider world

since the pledge is less easily discoverable than a charge. If a third party wished to know whether a legal person had created a security interest over its [crypto-token], the question would be whether the transfer of that [token] into the control of the secured creditor would give sufficient publicity. If the [crypto-token] is no longer associated with the public key of the grantor of the security interest (and is now associated with the public key of the secured creditor), then arguably there is sufficient publicity. It should be noted that this situation is identical (in its factual attributes) to the legal mortgage, which, if created by a company, would require registration. If the pledge could be created by a transfer of control in a different way (eg by giving the pledgee exclusive control of the private key) then it is harder to see that this would produce sufficient publicity.

18.40 They suggested that there were two policy questions that needed to be asked when considering the utility of possessory security over data objects:

> First, does factual control/possession give sufficient publicity of a security interest over that asset? Second, are there imperative market-based reasons for exempting a security interest created by transferring control to the secured creditor from registration, even if the answer to the first question is no?
>
> If the answer to either question is 'yes' then the method by which the policy can be given effect to is either by enabling a pledge to be taken over [data objects], or by specific legislation to exempt security interests over [data objects] from a registration requirement if control is transferred to the secured creditor. If the latter route is taken, the relationship between such legislation and the FCARs would need to be considered carefully.

18.41 Similar points were raised by the City of London Law Society, who noted that a lack of any public registration requirement for possessory security devices risked "'false wealth' or fraud or other operational risk considerations". They said the absence of any need for registration "is unlikely to produce the correct policy result in the interests of the safe and efficient operation of the financial markets". However, they caveated their remarks with the observation that "for certain types of asset operating in certain markets", other factors may justify the lack of a registration requirement.[1634]

Provisional conclusion on possessory security arrangements

18.42 In our provisional view, allowing for possessory security arrangements in respect of crypto-tokens would be of limited practical benefit and could give rise to problems:[1635]

(1) The fundamental requirement that a pledgee must obtain and retain possession or control to acquire and maintain a valid security interest would likely be unduly restrictive. As previously noted and analysed further below, collateral holding arrangements for crypto-tokens may involve multiple parties and automated processes through which control may be dispersed and change in quality and character over time. We think such arrangements are more easily accommodated through and characterised by reference to security interests

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[1634] The City of London Law Society compared such a lack of a registration requirement to the disapplication of such a requirement under the FCARs.

[1635] We accept that these problems are particularly acute for sophisticated financial market participants.

that are not fundamentally founded on static, comprehensive notions of either possession or control.

(2) There is considerable uncertainty as to whether and on what conceptual basis pledges can validly be granted over an unallocated part of an identified bulk of fungible assets.[1636] This fundamentally undermines their utility as a potential secured financing structure for crypto-token intermediaries, which routinely utilise omnibus accounts to hold the entitlements of their customers on a commingled, unallocated basis.

(3) Allowing crypto-tokens to be the subject of pledges could lead to a problematic reduction in transparency,[1637] given the lack of registration requirements in relation to such arrangements. This is arguably less of a problem in relation to conventional tangible assets, whose physical location is more easily discernible (meaning it is easier to see, at least prima facie, who holds them).

18.43 For the reasons we discuss below, we provisionally conclude that it would be more productive for the law of England and Wales to direct law reform efforts at crypto-token collateral arrangements that build on and enhance the inherent flexibility of non-possessory security interests. We consider that this approach is more appropriate than attempting to expand the scope of comparatively more rigid forms of security arrangement that have historically been based on possession (and therefore have developed by reference to tangible objects of personal property rights).

Consultation Question 37.

18.44 We provisionally conclude that it is not desirable to make provision for data objects to be the subject of possessory securities such as the pledge, or to develop analogous security arrangements based on a transfer of control. Do you agree?

If not, please provide specific examples of market structures or platforms that would benefit from the availability of possessory security arrangements, that could not be effectively structured using the non-possessory security frameworks currently available.

THE FINANCIAL COLLATERAL ARRANGEMENTS REGIME AND ITS POTENTIAL APPLICATION TO CRYPTO-TOKENS

18.45 We now turn to the special regime developed for financial collateral arrangements — . As we explain in the following sections, given the expansive scope of the FCARs we believe that a broad range of crypto-token markets-related activities could potentially be secured by financial collateral arrangements. It is possible to argue that certain forms of crypto-tokens may already fall within the definition of “financial collateral”

[1636] M Bridge, L Gullifer, K Low and GMcMeel, *The Law of Personal Property* (3rd ed 2021) para 16-024 to 16-026.

[1637] Albeit this would not necessarily be the case or could be ameliorated in different ways, which we discuss below.

used in the FCARs and that this may become increasingly so over time (either intentionally or unintentionally). However, for the purposes of structuring a crypto-token collateral arrangement, the FCARs currently represent at best a piecemeal solution of uncertain application. They also implement a legal regime that was designed without any specific expectation that it would apply to, and without any consideration of the peculiar features and requirements of, crypto-token and cryptoasset markets,[1638] and related collateral holding structures.

18.46 Furthermore, the FCARs are widely regarded as problematic even in their application to the conventional wholesale financial markets that were the primary driver for their original implementation. Much of the criticism from market participants has focused on the formulation and subsequent interpretation by the courts of the "possession or control" test that constitutes the FCARs' sole perfection requirement for qualifying security interest-based collateral arrangements.[1639] Concerns about the FCARs' capacity, as currently drafted, to accommodate various market standard collateral management practices has prompted numerous calls for reform.[1640] As we explain below, these deficiencies will also raise difficulties in the context of crypto-token collateral facilities. We therefore provisionally conclude that an extension of the FCARs formally and more comprehensively to encompass crypto-token collateral arrangements would not be appropriate.

Consultation Question 38.

18.47 We provisionally conclude that the Financial Collateral Arrangements (No 2) Regulations 2003, SI 2003 No 3226 (the "FCARs") should not be extended to more formally and comprehensively encompass crypto-token collateral arrangements. Do you agree?

[1638] As we discuss below, some crypto-token and cryptoasset markets are currently subject to price and volume volatility, technical fragility and vulnerability to manipulation or exploits, and operate without comprehensive regulatory oversight. Not all of these issues relate to crypto-tokens themselves — many instead relate to the relative nascence of the crypto-token and cryptoasset markets. However, as we discuss in more detail throughout this paper, there are certain features of crypto-tokens that make them operate differently to those assets that are the subject of conventional wholesale financial markets.

[1639] L C Ho "The Financial Collateral Directive's practice in England" [2011] 26 *Journal of International Banking Law and Regulation* 151, 151. The author notes that "the Financial Collateral Directive has achieved only limited success in England, thanks in part to the poor drafting of the FCAR[s], though some defects have been remedied by the [Financial Markets and Insolvency (Settlement Finality and Financial Collateral Arrangements) (Amendment) Regulations 2010 (SI 2010 No 2993)] which ironically have created some new problems".

[1640] Law Commission of England and Wales, "Intermediated securities: who owns your shares? A Scoping Paper" (2020) paras 7.78 to 7.80.

Overview of the FCARs framework

18.48 The FCARs constitute the UK's domestic implementation of the EU Financial Collateral Directive ("FCD").[1641] The purpose of the FCD is to:[1642]

> facilitate the provision of financial collateral under bilateral transactions, and thereby promote not only the stability of the financial markets but also their efficiency, by requiring Member States to disapply rules of law and statutory provisions that would otherwise invalidate financial collateral arrangements.

18.49 The FCARs implement the FCD by exempting "financial collateral arrangements" from certain formality requirements and insolvency provisions,[1643] including:

(1) formality requirements applicable to guarantees,[1644] dispositions of equitable interests,[1645] and assignments of legal rights;[1646]

(2) registration requirements for company charges under section 859A of the Companies Act 2006; and

(3) provisions in the Insolvency Act 1986 empowering an administrator to deal with the charged assets and giving preferential status to certain creditors over the charged assets.

18.50 The broad purpose of these various exemptions is to reduce the "administrative burden" on the parties[1647] and to enable "rapid" enforcement of security interests in the event of insolvency.[1648]

18.51 The FCARs create a regime for qualifying collateral arrangements based on both security interest and title transfer structures. To fall within their scope, a collateral arrangement must be:

(1) Entered into between non-natural persons;[1649]

[1641] European Directive on Financial Collateral Arrangements, Directive 2002/47/EC of the European Parliament and Council of 6 June 2002, OJ L 168/43.

[1642] L Gullifer and R Goode, *Goode and Gullifer on Legal Problems of Credit and Security* (6th ed 2017) para 6-26; see also Directive recitals 3, 5, 10 and 17.

[1643] FCARs, SI 2003 No 3226, reg 4.

[1644] Statute of Frauds 1677, s 4.

[1645] Law of Property Act 1925, s 53(1)(c).

[1646] Law of Property Act 1925, s 136.

[1647] FCD, recital 10.

[1648] FCD, recital 17.

[1649] Defined in reg 3(1) FCARs as "any corporate body, unincorporated firm, partnership or body with legal personality except an individual, including any such entity constituted under the law of a country or territory outside the United Kingdom or any such entity constituted under international law". Qualifying parties are not therefore limited to wholesale mainstream financial markets participants. This definition means that the FCAR's personal scope of application is wider than that required by the FCD (see art 1(2) of the FCD).

(2) Evidenced in writing;[1650]

(3) Granted to secure or otherwise cover "relevant financial obligations".[1651] The FCARs definition covers not just monetary payment obligations, but also delivery obligations even if they are in respect of assets that do not themselves qualify as forms of financial collateral. "Relevant financial obligations" could therefore include, for example, a physically settled forward contract for the delivery of a quantity of a form of crypto-tokens (regardless of whether those crypto-tokens satisfied the definition of "financial collateral" or not);

(4) Granted in respect of "financial collateral", which is defined as meaning "cash, financial instruments or credit claims";[1652] or

(5) An arrangement that otherwise satisfies the definition of one of the two categories of "financial collateral arrangement".[1653]

18.52 There is nothing in this list of qualifying factors that would necessarily prevent crypto-token market participants being parties to, nor undertakings to deliver crypto-tokens being obligations secured or covered by, a qualifying financial collateral arrangement. However, whether crypto-tokens can themselves be utilised as collateral under a qualifying financial collateral arrangement depends on whether they satisfy the definition of "financial collateral". That is, are they either cash, financial instruments or credit claims for the purposes of the FCARs? We consider these questions below.

18.53 The following discussion pertains to the current law under the FCARs and different possible interpretations of them in their application to crypto-tokens specifically. Although we summarise the issues and arguments, we do not seek to offer any definitive conclusion as to the scope and application of the current law.

The "financial collateral" definition and its potential application to crypto-tokens

Cash

18.54 Cash within the FCARs means:[1654]

> money in any currency, *credited to an account*, or a similar claim for repayment of money and includes money market deposits and sums due or payable to, or received between the parties in connection with the operation of a financial collateral arrangement or a close-out netting provision. (emphasis added)

[1650] See the definitions of both "title transfer financial collateral arrangement" and "security financial collateral arrangement" in reg (3)(1) FCARs.

[1651] In reg 3(1) FCARs, "relevant financial obligations" are defined broadly to mean "the obligations that are secured or otherwise covered by a financial collateral arrangement….". See further: L. Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th ed 2017) para 6-28.

[1652] The definitions of the individual categories of financial collateral and their potential application to different forms of crypto-tokens are considered in more detail below from para 18.54.

[1653] Reg 3(1) FCARs. The two categories are "security financial collateral arrangement" and "title transfer financial collateral arrangement".

[1654] Reg 3 FCARs.

18.55 The precise boundaries of this definition are not easy to identify. Credit balances in bank accounts are clearly covered but the meaning of "similar claim for the repayment of money" is uncertain.[1655] The authors of *Yeowart and Parsons on The Law of Financial Collateral* suggest that this element of the definition relates to claims that involve a debtor-creditor relationship although not necessarily a borrower-lender relationship, despite the use of the word "repayment". They conclude that it would encompass money claims that are not evidenced by an account entry, but which could be so evidenced in accordance with standard accounting principles and practice.[1656]

18.56 Claims arising in connection with the operation of a financial collateral arrangement or a close-out netting provision are expressly included in the definition of cash. Again, however, these claims must be for the payment of *money*. In our 2005 report on company security interests we considered this issue in relation to claims under commodities contracts (such as a commodity future, option, or similar contract). We concluded that, even though they may be held in an intermediary account and used as collateral in much the same way as financial collateral, such claims would likely not constitute cash for the purpose of the FCARs.[1657]

Applying the "cash" definition to crypto-tokens: general principles

18.57 For a crypto-token to qualify as a form of cash for the purposes of the FCARs it would first need to constitute "money in any currency". However, this term is not defined in either the FCD or the FCARs, whether in general or by specific reference to the status of crypto-tokens.[1658]

18.58 As a matter of law, there is no general conception or statutory definition of money that is of broad application. The meaning of "money" is highly context dependent.[1659] From an economic perspective, it is possible to characterise an asset as money if it is used to perform the core social functions of money and thereby acts as a medium of exchange, a unit of account and a store of value.[1660]

18.59 There is no consensus among academics as to whether (some types of) crypto-tokens ought (at present) be characterised as money for the purposes of the private law of

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[1655] L C Ho "The Financial Collateral Directive's practice in England" [2011] 26 *Journal of International Banking Law and Regulation* 151, 155. "Cash" does not include cash in the form of bank notes (or coins): Recital 18, FCD; nor does it include book debts (although in certain circumstances they could qualify as financial collateral by reason of being a credit claim): G Yeowart, R Parsons, E Murray and H Patrick, *Yeowart and Parsons on The Law of Financial Collateral* (2016) para 3.09.

[1656] G Yeowart, R Parsons, E Murray and H Patrick, *Yeowart and Parsons on The Law of Financial Collateral* (2016) paras 3.07, 3.10.

[1657] Company Security Interests (2005) Law Com No 296 para 5.29. This is despite the fact that in practice such claims normally represent rights to payments of differences and are thus roughly equivalent to "cash" held in an account.

[1658] The lack of any reference to crypto-tokens is unsurprising given that the FCARs (both in its original form and as subsequently amended) predate the emergence of crypto-tokens as an asset class and the substantial growth in the volume and value of crypto-token trading markets in recent years.

[1659] E McKendrick, *Goode on Commercial Law* (6th ed 2020) para 17.05.

[1660] D Fox, *Property Rights in Money* (2008) paras 1.19 to 1.30; G Yeowart, R Parsons, E Murray and H Patrick, *Yeowart and Parsons on The Law of Financial Collateral* (2016) para 3.21, citing *Halsbury's Laws of England* (5th ed) vol 49 para 1276; M Solinas, "Bitcoins in Wonderland: Lessons from the Cheshire Cat" [2019] 3 *Lloyd's Maritime and Commercial Law Quarterly* 433, 444.

England and Wales. For example, Perkins and Enwezor, argue that crypto-tokens "which have achieved status as a medium of exchange within a significant user community [which need not necessarily be established within the local domestic public], which are sufficiently robustly engineered to achieve economic value and which have proved to be not only transferable but tradable, have a good claim to be regarded as money".[1661]

18.60 However, other academic commentators have suggested that in addition to these functional criteria an asset will only be treated as money in law if it is also denominated in a state-authorised unit of account.[1662]

Applying the "cash" definition to crypto-tokens: specific examples

18.61 There remains a considerable divergence of opinion among commentators and practitioners about how money should be defined, whether as a matter of private law generally, or in relation to "cash" specifically under the FCARs.

18.62 Despite the interpretative uncertainty, we would nevertheless make the following observations. These observations are not intended to constitute commentary on the monetary status or otherwise of crypto-tokens. Instead, they are a limited and specific comment on the clarity (or otherwise) of the definition of "cash" used in the FCARs.[1663]

(1) To the extent that they qualify at all, crypto-token entitlements held via intermediary custodians and custodial exchanges are comparatively more likely to be characterised as cash than directly controlled "on chain" crypto-tokens because of the condition that cash for the purposes of the FCARs definition must be "credited to an account".

(2) Intermediary account-based entitlements to crypto-tokens that are denominated in and track the value of state-issued currencies (that is, "stablecoins" such as USDC) are the category of crypto-token interests that are most likely to fall within the cash definition.[1664]

(3) To the extent that they qualify at all, it could be argued that intermediary account-based entitlements to crypto-tokens are potentially more likely to satisfy the cash definition if they have been recognised as legal tender by

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[1661] J Perkins, J Enwezor, 'The legal aspect of virtual currencies' [2016] *Journal of International Banking and Financial Law* 569, 570 to 572. See also R Cohen, P Smith, V Arulchandran, A Sehra, 'Automation and blockchain in securities issuances' [2018] *Journal of International Banking and Financial Law* 144, 149 to 150; and M Solinas, "Bitcoins in Wonderland: Lessons from the Cheshire Cat" [2019] 3 *Lloyd's Maritime and Commercial Law Quarterly* 433, 444 to 445.

[1662] It is important to note that this is *not* the same as limiting money to assets that have the status of legal tender. See also D Fox, "Cryptocurrencies in the Common Law of Property" in *Cryptocurrencies in Public and Private Law* (2019) para 6.62. in addition, and in relation to the functional test for money, Professor Fox argues (at para 6.61) that relatively widespread use and/or acceptance among the general *domestic* public could potentially be required.

[1663] See also our discussion on the application to crypto-tokens of the special defence of good faith purchaser without notice that applies to money in Chapter 13. We also discuss actions for an agreed sum and, separately, "monetary" awards in more detail in Chapter 19.

[1664] L Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th ed 2017) para 6-05, n 35.

sovereign nation states[1665] (but perhaps only if they also fulfil the functional test of actually being used widely by the public as money in the relevant states).

(4) Crypto-token markets are highly dynamic and have undergone substantive change and growth even in the relatively brief period since a number of the academic commentaries referenced above were published. The fact that the authors of these commentaries repeatedly emphasise that their opinions are based upon market conditions at the time of writing suggest that the potential characterisation of various crypto-tokens as cash for the purpose of the FCARs may well change over time. For example, a major change in crypto-token markets that has occurred subsequent to many of the commentaries is the growth in stablecoins and stablecoin markets.[1666] Another recent trend has been the emergence of a global NFT market.[1667] Participants in these NFT markets (which represent a substantial, albeit globally distributed community) appear to be relying on native crypto-tokens as money in a functional sense. Whether that would result in those particular crypto-tokens being characterised (at present or some future point in time) as cash for the purpose of the FCARs as currently drafted, however, remains a question that cannot currently be answered with any real certainty.

Financial instruments

18.63 "Financial instruments" are defined in the FCARs as:[1668]

(1) shares in companies and other securities equivalent to shares in companies;

(2) bonds and other forms of instruments giving rise to or acknowledging indebtedness if these are tradeable on the capital market; and

(3) any other securities which are normally dealt in and which give the right to acquire any such shares, bonds, instruments or other securities by subscription, purchase or exchange or which give rise to a cash settlement (excluding instruments of payment).

18.64 The definition also covers explicitly:[1669]

(1) units of a collective investment scheme within the meaning of the Financial Services and Markets Act 2000;

(2) eligible debt securities within the meaning of the Uncertificated Securities Regulations 2001;

[1665] Such as El Salvador and the Central African Republic: S Perez, C Ostroff, "El Salvador Becomes First Country to Adopt Bitcoin as National Currency" (September 2021): https://www.wsj.com/articles/bitcoin-comes-to-el-salvador-first-country-to-adopt-crypto-as-national-currency-11631005200.

[1666] TheBlockCrypto, "Stablecoin Supply Charts": https://www.theblockcrypto.com/data/decentralized-finance/stablecoins.

[1667] IntoTheBlock, "NFT Analytics & Insight": https://www.intotheblock.com/.

[1668] FCARs, reg 3.

[1669] FCARs, reg 3(1).

(3) money market instruments;

(4) claims relating to or rights in or in respect of any of the financial instruments referred to in the preceding part of the definition; and

(5) any rights, privileges or benefits attached to or arising from any such financial instruments."[1670]

Applying the "financial instruments" definition to crypto-tokens

18.65 The definition of "financial instruments" encompasses a number of different types of securities. Where they are issued in tokenised form, they would seem to qualify as financial collateral (whether held directly or via an intermediary).[1671] This would include for example:

(1) Tokenised equity, even if issued by a private company (whether registered in the United Kingdom or in a foreign country) and/or with transferability limitations to give practical effect to transfer restrictions set out under the issuer's articles of association or the terms of the shareholders' agreement.

(2) Tokenised bond or debt instruments, but only if they are "tradeable on the capital market".[1672]

18.66 As with the "cash" definition, the boundaries of what constitutes "financial instruments" are not entirely clear. Crypto-tokens that have been issued with the intention of representing a tradeable percentage ownership interest in a basket of crypto-tokens[1673] could constitute "financial instruments" in a number of ways. They could be characterised as shares, debt instruments, interests in collective investment schemes, or even "any other securities which are normally dealt in and…give rise to a cash settlement". In summary, although its precise scope is uncertain, the "financial instruments" definition will at most apply only to a limited subset of crypto-tokens (or perhaps, more accurately, cryptoassets).

Credit claims

18.67 Credit claims were added to the definition of financial collateral in the FCARs in 2010.[1674] They constitute monetary claims arising out of an agreement for the repayment of credit granted in the form of a loan by a bank or other credit institution. Credit institution in this context means "an undertaking the business of which is to take

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[1670] Reg 3(1) FCARs.

[1671] The effect of the inclusion of the phrase "claims relating to or rights in or in respect of any of the financial instruments referred to in the preceding part of the definition" is to expressly extend the definition to qualifying financial instruments that are held via intermediaries so that the rights and entitlements of beneficiaries under indirect and intermediated holdings can benefit from the FCARs.

[1672] See G Yeowart, R Parsons, E Murray and H Patrick, *Yeowart and Parsons on The Law of Financial Collateral* (2016) paras 3.46 to 3.50.

[1673] For example, through an NFT fractionalisation platform such as Fractional Art or Fusible. For further analysis of NFT fractionalisation see from para 16.34.

[1674] By Financial Markets and Insolvency (Settlement Finality and Financial Collateral Arrangements) (Amendment) Regulations 2010 (SI 2010/2993), reg 1.

deposits or other repayable funds from the public and to grant credits for its own account".[1675]

18.68 At present, it seems unlikely that any crypto-tokens would constitute loan-based monetary claims issued by credit institutions, but it is certainly possible that they could do so in the future. This is particularly so if tokenisation becomes more prevalent among regulated financial institutions for representing and transferring financial claims.

Conclusions

18.69 It is therefore possible to argue that certain forms of crypto-tokens fall within the definition of "financial collateral" used in the FCARs, particularly intermediated account-based entitlements to tokens denominated in state-issued currencies and tokenised securities. However, there is considerable uncertainty as to the definition's application to different crypto-token forms and holding structures.[1676] Consequently, the FCARs in its current form does not provide a reliable legal framework for structuring crypto-token collateral arrangements, with trading or investment portfolios comprising a diverse array of crypto-token holdings that are not held via intermediary accounts being least likely to fall within scope.

Security financial collateral arrangements and the "possession or control" requirement

18.70 The FCARs apply to qualifying collateral arrangements based on either title transfer or security interest structures. Despite the utility of title transfer arrangements, as we discussed above,[1677] they provide parties (post close-out)[1678] with only an unsecured claim to the repayment of any surplus proceeds. For crypto-token lending market participants that are concerned to manage their exposure to collateral taker insolvency risk, security interest-based collateral arrangements are likely to be the preferred structuring option.

[1675] The meaning of "Credit Institution" is as defined in Regulation (EU) 575/2013 (typically referred to as the EU Capital Requirements Regulation), art 4(1)(1).

[1676] H Liu and L Gullifer, Financial collateral arrangements in the digital asset world (2022) *Journal of International Banking and Financial Law* (forthcoming).

[1677] See para 18.14 above.

[1678] Close out refers to the process by which a contract is terminated, all transactions or obligations governed by that contract are accelerated so as to be immediately due and payable or due for performance, and all non-monetary obligations are converted into their monetary equivalents. These sums are then aggregated and netted against each other in settlement of the related claims. To the extent that that the obligation owed by each party to the other do not match there will be a single payment claim representing the value of the net surplus remaining. Note that issues of netting and/or set off (whether contractual, by mandatory operation of law or otherwise) will be important for the future development of crypto-token markets but are outside the scope of this consultation paper.

18.71 However, for a security interest-based[1679] crypto-token collateralised facility to come within the scope of the FCARs, it would need to satisfy the regime's perfection requirement of being an arrangement under which financial collateral:[1680]

> is delivered, transferred, held, registered or otherwise designated so as to be *in the possession or under the control* of the collateral-taker or a person acting on its behalf.

18.72 In 2011 the FCARs were amended to incorporate a partial definition for "possession", which states that:[1681]

> For the purposes of [the FCARs] "possession" of financial collateral in the form of cash or financial instruments includes the case where financial collateral has been credited to an account in the name of the collateral-taker or a person acting on his behalf (whether or not the collateral-taker, or person acting on his behalf, has credited the financial collateral to an account in the name of the collateral-provider on his, or that person's, books) provided that any rights the collateral-provider may have in relation to that financial collateral are limited to the right to substitute financial collateral of the same or greater value or to withdraw excess financial collateral.

18.73 The effect of this amendment was to clarify that for the purposes of the FCARs, intangible assets in the form of cash or intermediated securities entitlements booked to an account in the name of the collateral taker were capable of being "possessed".[1682]

18.74 "Control" remains undefined in the FCARs themselves and so it has been left to the courts to provide guidance on its interpretation and application, while at the same time elaborating further on the related conception of possession.

Interpreting the "possession or control" requirement under the FCARs

18.75 We briefly consider the application of control to existing collateral arrangements, because we go on to consider whether and how this concept could apply to collateral arrangements over crypto-tokens. In the context of collateral arrangements, it is possible to analyse the differing conceptions of control that could potentially apply by reference to the following four-fold classification:

[1679] Defined as "any legal or equitable interest or any right in security, other than a title transfer financial collateral arrangement, created or otherwise arising by way of security" and includes all four forms of consensual security interests that are available under the general law: pledge, lien, mortgage, and charge.

[1680] FCARs, reg 3 (emphasis added).

[1681] FCARs, reg 3(2).

[1682] This change was enacted as a response to widespread concern among market participants prompted by the decision of the High Court in *Gray v G-T-P Group Ltd; Re F2G Realisations Ltd (In Liquidation)* [2010] EWHC 1772. In that case, in the context of considering the meaning of "possession or control" under the FCARs, the judge stated (at [54]) that "possession has no meaning in English law as regards intangible property". He made this statement despite acknowledging that the phrase had to be given an independent meaning derived from the legislative intent behind the FCD and that accordingly it "would not be right to construe it according to English law principles".

(1) Positive control, which is the ability to take or dispose of an asset from the collateral pool.

(2) Negative control, which is the ability to prevent an asset being taken or disposed of from the collateral pool.

(3) Legal control, which is the legally enforceable right or power to (i) take or dispose, and/or (ii) prevent the taking or disposing, of an asset from the collateral pool.

(4) Administrative (or factual) control, which refers to the practical ability to (i) take or dispose, and/or (ii) prevent the taking or disposing, of an asset from the collateral pool.[1683]

18.76 In *Re Lehman Brothers International (Europe) (in administration)*,[1684] Mr Justice Briggs (as he then was) had to consider the meaning of "possession or control" in the context of a charge granted to an intermediary over dematerialised book entry securities entitlements booked to an account maintained by that intermediary on behalf of an affiliate. Adopting the four-fold classification of control set out above and drawing on an analysis of the policy objectives behind the equivalent requirement and the associated notion of "dispossession" set out in the FCD, the judge reached the following conclusions:[1685]

> …It seems to me that [FCD art 2.2] clearly contemplates that a particular form of delivery, transfer, holding, registration or designation may be sufficient to establish possession but not control, or control but not possession, but that in either case the requirements of [FCD art 2.2] would be satisfied… both "possession" and "control" mean *something more than mere custody of financial collateral*…. The reference … to rights of substitution or withdrawal strongly suggest … *legal rather than administrative control* as the appropriate criterion …

18.77 In light of the above statements (together with the preceding decisions in *Gray*[1686] and *Swedbank*,[1687] and the 2011 revisions to the FCARs), it appears that the current position at law in regard to "possession or control" under the FCARs is as follows:

(1) Mere administrative or factual (positive and/or negative control) is insufficient to establish either "possession" or "control".

(2) Control for the purposes of the FCARs is different from the concept of control that we propose in connection with the recognition and development of a third category of personal property that applies to data objects. It is not (or not solely)

1683 E Zaccaria, "An inquiry into the meaning of possession and control over financial assets and the effects on third parties" [2017] *Journal of Corporate Law Studies* 1, 4 to 5 (page references are to the open access version). L Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th ed 2017) para 6-43.

1684 [2012] EWHC 2997.

1685 [2012] EWHC 2997 at [131] to [132], [134], [136] (emphasis added).

1686 *Gray v G-T-P Group Ltd; Re F2G Realisations Ltd (In Liquidation)* [2010] EWHC 1772.

1687 *Private Equity Insurance Group SIA v Swedbank AS* [2017] 1 WLR 1602.

a question of fact but fundamentally and necessarily incorporates a legal construct: specifically, a legally enforceable right to exercise negative control.

(3) Possession for the purposes of the FCARs is different to the common law concept of possession that we discuss, for example, in Chapter 11 of this consultation paper. It is a composite factual and legal construct that must incorporate a legally enforceable right to exercise negative control.[1688] Whether the level of legal control required for possession is the same or less exacting than the level required for standalone (non-possessory control) is uncertain.[1689]

(4) The test for control is definitely satisfied by legal negative control in combination with any of factual negative, factual positive, or factual negative and factual positive control.

(5) The test for control is probably capable of being satisfied by legal negative control alone, without any form of practical control.[1690]

(6) The legally enforceable right to exercise negative control necessary to establish possession or (non-possessory) control for the purposes of the FCARs does not have to be absolute. It can be subject to certain qualifications including where the collateral provider has retained or been granted the legal right to the return of excess collateral or the legal right to substitute collateral of the same or greater value.[1691] The fact that certain rights reserved or granted to the collateral provider do not compromise the collateral taker maintaining control to a degree sufficient to satisfy the FCARs' test has prompted some commentators to suggest that control is not intended to be exercised over specific assets but to account-based pools of assets the composition of which may fluctuate and change substantially over time.[1692]

Applying "possession or control" to crypto-token collateral arrangements

18.78 It is not necessarily straightforward to apply the concept of "possession or control" under the FCARs to crypto-token collateral arrangements. Collateral arrangements

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[1688] In addition and unlike possession under the common law, possession for the purposes of the FCARs does not include an explicit intention element, although it is possible that this is implied by the incorporation of (intention-based) legal contractual rights of control into the concept.

[1689] See also G Yeowart, R Parsons, E Murray, H Patrick *Yeowart and Parsons on The Law of Financial Collateral* (2016) para 8.76 to 8.77.

[1690] See *Re Lehman Brothers International (Europe) (in administration)* [2012] EWHC 2997 at [136] by Briggs J. See further L Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th ed 2017) para 6-44, and E Zaccaria, "An inquiry into the meaning of possession and control over financial assets and the effects on third parties" [2017] *Journal of Corporate Law Studies* 1, 16 to 18 (page references are to the open access version).

[1691] FCARs reg 3(1).

[1692] *Re Lehman Brothers International (Europe) (in administration)* [2012] EWHC 2997 at [133] by Briggs J. See also E Zaccaria, "An inquiry into the meaning of possession and control over financial assets and the effects on third parties" [2017] *Journal of Corporate Law Studies* 1, 23 (page references are to the open access version), and L Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th Edition 2017) para 6-44.

comprising crypto-tokens that qualify as financial collateral can be implemented in multiple configurations. These could exhibit or incorporate the following features:

(1) For the duration of the loan, crypto-token collateral may not be practically controllable by either the collateral taker or the collateral provider but subject to an automated holding arrangement, such as an "escrow smart contract". The holding arrangement may be coded automatically to permit positive practical control by the collateral provider upon settlement of the loan within the permitted repayment period or by the collateral taker upon a repayment default.[1693]

(2) Excess withdrawal and collateral substitution facilities may not be determined solely at the discretion of the collateral taker.[1694] Responsibility for quantification and access may be allocated to or shared with the collateral provider or a third party. Alternatively, this could be automated through mechanisms such as smart contracts[1695] and flash loans[1696] that the collateral taker cannot control or override.

(3) Practical positive and/or negative control may be allocated to or shared with third parties in the following ways.

    (a) A third party may exercise full factual control and assume custodial responsibility of crypto-tokens on behalf of the collateral provider while undertaking to acknowledge and operate the collateral arrangement consistent with the rights of the collateral taker (or *vice versa*).

    (b) Alternatively, a third party could be engaged as a technology provider or as a co-signer under a multi-signature or multiparty computation wallet arrangement that facilitates shared practical control of the crypto-token collateral.

[1693] See for example, the Yawww Platform (https://www.yawww.io/), which provides a matching facility for peer-to-peer SOL-denominated loans and escrow smart contracts for associated NFTs issued on the Solana network to be used as collateral.

[1694] Furthermore, excess and exposure may be defined to intentionally leave the collateral taker undercollateralised, for example by setting the minimum collateral amount at a specified percentage below the total value of outstanding secured liabilities, or by omitting contingent liabilities from the exposure calculation.

[1695] Smart contracts can rely on external data providers (or "oracles"), for valuation inputs (see for example, Aave's use of an aggregated price feed from Chainlink, a decentralised oracle network).

[1696] Flash loans are special transactions that allow the borrowing of an asset, as long as the borrowed quantity (and a fee) is returned before the end of the transaction. The borrowing of the asset, the use of the borrowed asset for a particular purpose, and the return of the asset (and fee) are arranged and completed within a single "block" on a blockchain (for this reason they are sometimes called "One Block Borrows"). Because of this, these transactions do not require a user to supply collateral prior to engaging in the transaction — the borrowing, use of the asset and return of the asset will only occur and change the state of the blockchain if all three occur. Substitution of crypto-tokens held in on-chain collateral arrangements could therefore potentially be undertaken through flash loans in a similar way to how they are currently utilised in the Aave v2 and v3 platforms. See https://docs.aave.com/developers/guides/flash-loans for more detail on flash loans.

(4) Collateral providers may retain the practical capacity to dispose of, extract value from or directly access the functionality of crypto-tokens subject to collateral arrangements that go beyond the excess withdrawal and substitution rights that are expressly recognised in the FCARs. Forms of access could include the capacity to withdraw distributions received in connection with crypto-tokens such as staking rewards or airdrops or the exercise of voting or other governance-related functionalities.

18.79 If an agreement were aligned with the practical operation of the shared and/or conditional control arrangements described above it may fail to satisfy the core test of legal negative control required under the FCARs. Furthermore, it may not (or may not necessarily) incorporate the practical control necessary to demonstrate possession for the purposes of the FCARs.[1697]

18.80 Therefore, there is considerable uncertainty over the extent to which intermediated and on-chain crypto-token collateral arrangements will be able to satisfy the "possession or control" requirement under the FCARs in its current form. In any event, given the variety of control configurations possible with crypto-token collateral arrangements, legal negative control seems an inappropriate conceptual basis on which to build a perfection rule.[1698]

DEVELOPING A BESPOKE LEGAL FRAMEWORK FOR CRYPTO-TOKEN COLLATERAL ARRANGEMENTS

18.81 The legal structures available for security and title transfer arrangements provide a potential foundation for structuring a variety of collateral arrangements in respect of crypto-tokens. However, the rules governing their creation and operation place legal and practical limits on the extent to which they can be effectively utilised in relation to crypto-tokens. In addition, given the uncertainties with the application of the FCARs referred to above, we consider that it is unlikely that market participants will seek to rely on the provisions of the FCARs for structuring collateral arrangements with respect to crypto-tokens. Furthermore, reform to the FCARs to encompass crypto-tokens could risk undermining the clarity of the application of the FCARs to conventional wholesale financial market instruments. We therefore conclude this chapter by considering the possibility of developing a specific legal regime for crypto-token collateral arrangements that directly recognises their financial and technical features and that is responsive to the emergence of new technical innovations.

18.82 Formulating the detailed substantive provisions of any future crypto-token collateral regime will require a detailed exercise including rigorous cost benefit analysis, not only

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1697 As Professor Gullifer points out in relation to the treatment of rights to the return of excess collateral under the FCARs, "The uncertainty of the scope of this, very significant, exception to the absolute nature of possession or control is unfortunate in a regime which purports to create legal certainty": L Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th ed 2017) para 6-44. See also FMLC "ISSUE 1: COLLATERAL DIRECTIVE: Analysis of uncertainty regarding the meaning of "possession or ... control" and "excess financial collateral" paras 2.15 to 2.18, 3.4; *Re Lehman Brothers International (Europe) (in administration)* [2012] EWHC 2997 at [132]; and G Yeowart, R Parsons, E Murray, H Patrick, *Yeowart and Parsons on The Law of Financial Collateral* (2016) para 8.18.

1698 H Liu and L Gullifer, "Financial collateral arrangements in the digital asset world" (2022) *Journal of International Banking and Financial Law* (forthcoming).

in relation to crypto-token markets and their participants, but to financial markets more broadly, as well as the real economy. Such an analysis, and the development of proposals for any such regime, is beyond the scope of this consultation paper. However, given our conclusions in respect of how crypto-token collateral arrangements can currently be used under the law of England and Wales, we consider that it is important to consider issues relating to how such a regime could be structured from a legal perspective. We consider that this will be an important starting point for market participants to begin to consider and offer their views on the development of the law of England and Wales in this area. As such, we do not make any proposals for reform, but ask two open questions.

18.83 In developing and framing our considerations we take note of recent statements made by the UK Government announcing policies that are aimed at making the UK a global hub for crypto-token and cryptoasset technology and investment.[1699] We recognise that having a private law regime that provides crypto-token technology developers, as well as community and market participants, with a clear framework for building new products and applications will play an important role in realising this policy objective. In addition, we consider that it will be important to ensure that any new regime is aligned with, and supportive of, changes in the regulatory environment.[1700]

18.84 That said, a legal regime that supports innovation can also influence its direction of development. For example, integrating crypto-token markets with mainstream financial markets through the creation of a unified, undifferentiated collateral regime modelled on an expanded reworking of the FCARs could encourage crypto-token markets to adopt the structural characteristics of mainstream financial markets. This could result in an increasing reliance on certain key market intermediaries to facilitate and provide core financial services, including trading, financing, and custody. As a result, their (potentially systemic) importance would be further enhanced within crypto-token markets.

18.85 Alternatively, maintaining differentiated regimes might be better for encouraging innovation through a broader and more diverse range of technology applications and business models. This would have the effect of encouraging an alignment of business practices where appropriate (for example, by facilitating the translation of collateral and risk management techniques developed for and by mainstream financial markets intermediaries to crypto-token service providers that utilise a CeFi model). It would also preserve opportunities for different applications and business models in the DeFi sector to develop that perhaps might better exploit opportunities for decentralisation, disintermediation, and automation through direct utilisation of the native technological features and capabilities of crypto-token systems.

18.86 The degree of separation manifested by a boundary between any crypto-token collateral regime(s) and the financial collateral regime mainstream financial markets

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[1699] Keynote Speech by John Glen MP, Economic Secretary to the Treasury, at the Innovate Finance Global Summit (4 April 2022).

[1700] For example, the decision to bring stablecoins — where used as a means of payment — within the regulatory perimeter supervised by the Financial Conduct Authority and the Bank of England. See HM Treasury "UK regulatory approach to cryptoassets, stablecoins, and distributed ledger technology in financial markets: Response to the consultation and call for evidence" (April 2022) pp 2 to 3, 7 to 23).

could also be used to control spillover effects.[1701] Finance receivers and financing intermediaries operating in both sectors could provide channels for the transmission of systemic risk between crypto-token and mainstream markets.[1702]

18.87 Furthermore, as noted above, collateral takers under arrangements that fall within the scope of the FCARs obtain substantial advantages through the disapplication of various provisions of the insolvency code that would otherwise apply. These include rules that could prevent the rapid enforcement of collateral realisation rights, undermine the validity of certain pre-insolvency collateral transfers, suspend the exercise of termination rights and that reserve a portion of collateral value for distribution to other preferential creditors or for the settlement of other debts. The disapplication of these provisions for financial collateral arrangements has been justified from a policy perspective in that they help support the stable and efficient operation of financial markets by reducing systemic risk caused by "domino" contagion effects.[1703] "Domino" contagion risk refers to the potential for the insolvency of a prominent institution to trigger a series of defaults in back-to-back transactions causing financial distress to cascade through chains of counterparties across the market.[1704]

18.88 These benefits are said to outweigh third party and societal costs resulting from the consequential reduction in assets available for distribution to other creditors and the diminished capacity and prospects for rehabilitation of an insolvent entity.

18.89 While this conclusion may be defensible[1705] in relation to conventional wholesale financial markets and the activities of financing intermediaries that support their operation, it is not self-evident that the same cost benefit assessment would apply to crypto-token markets and financing intermediaries.[1706] Many crypto-token markets, both in general and in relation to (and at times, as a result of) DeFi platforms in particular, exhibit substantial levels of price and volume volatility, technical fragility and vulnerability to manipulation or exploits, and operate without comprehensive regulatory oversight. And DeFi platforms and services often deal with the rapid enforcement of collateral realisation rights in specific, nuanced and highly technical

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[1701] See R Auer, M Farag and ors "BIS Working Papers 1013 – Banking in the shadow if Bitcoin? The institutional adoption of cryptocurrencies" (May 2022) Bank for International Settlements Working Papers.

[1702] See H J Allen, "DeFi: Shadow Banking 2.0?" [2022] *William and Mary Law Review* (forthcoming) pp 2, 10 to 11, 24. See also S Aramonte, W Huang, A Schrimpf, "DeFi risks and the decentralisation illusion" (2021) *BIS Quarterly Review*, 29 to 32.

[1703] The specific purpose behind introducing rapid and non-formalistic enforcement procedures for financial collateral arrangements was "to safeguard financial stability and limit contagion effects in case of a default of a party to a financial collateral arrangement" (FCD, recital (17)).

[1704] See R Mokal, "Liquidity, systemic risk, and the Bankruptcy treatment of financial contracts" [2016] 10(1) *Brooklyn Journal of Corporate, Financial and Commercial Law* 15, 45. The author strongly criticises this view of contagion in financial markets as being "a product of the unsatisfactory microprudential approach to systemic risk, [which] is theoretically implausible and empirically false".

[1705] The underlying policy argument is not universally accepted however, and has been subject to a degree of criticism. See R Mokal, "Liquidity, systemic risk, and the Bankruptcy treatment of financial contracts" [2016] 10(1) *Brooklyn Journal of Corporate, Financial and Commercial Law* 15.

[1706] H Liu and L Gullifer, Financial collateral arrangements in the digital asset world (2022) *Journal of International Banking and Financial Law* (forthcoming).

ways, generally based on the automatic execution of a number of related smart contracts.

18.90 Supporting the creation and rapid enforcement of collateral arrangements in crypto-token markets may well therefore have the effect of amplifying rather than diminishing systemic risk. [1707] Alternatively, a "one-size fits all" regime could have the unintended consequence of reducing the efficacy of DeFi platforms and structures which are designed to deal with risk in different ways to traditional financial markets.

18.91 A potential alternative to adopting a unified, comprehensive and undifferentiated regime for financial collateral and crypto-token collateral arrangements would be to develop a bespoke regime for the latter. Under this approach the FCARs regime may have to be updated expressly to exclude crypto-token collateral arrangements.

Key policy objectives

18.92 A legal framework that better facilitates the entering into, operation, rapid, priority enforcement and/or resolution of crypto-token collateral arrangements could have wide-ranging implications for other market participants and for the operation and development of crypto-token markets themselves. In formulating the scope and substance of any such framework it would be necessary to consider and strike an appropriate balance between a number of different objectives:

(1) The rights of solvent collateral takers to have the credit risk safeguards they have agreed and implemented in the form of crypto-token collateral arrangements to be given effect to in accordance with their terms and exercisable without undue delay.

(2) The rights of solvent collateral providers to obtain access to collateral that is not required to cover or settle obligations secured by the relevant arrangement in accordance with the terms agreed with their respective collateral taker counterparties without undue delay. [1708]

(3) Supporting the efficient and stable operation of crypto-token markets by recognising mechanisms that enhance liquidity and by preventing and/or constraining the development of sources of systemic risk.

(4) Supporting broader participation and continued innovation in crypto-token markets.

(5) Controlling the fraud risk exposure of parties to collateral arrangements and third parties by establishing appropriate evidentiary and publicity requirements for their validity and perfection respectively.

[1707] H J Allen, "DeFi: Shadow Banking 2.0?" [2022] *William and Mary Law Review* (forthcoming).

[1708] L Gullifer, *Goode and Gullifer on Legal Problems of Credit and Security* (6th Edition 2017) para 6-44, at which the author notes that the effect of the case law in England and Wales and *Swedbank* (dealing respectively with the interpretation of the "possession or control" test under the FCARs and the FCD) appears "to prioritise the safety of the collateral taker …. However, by entering into a security collateral arrangement as opposed to a title transfer collateral arrangement, the collateral provider is attempting to obtain some protection against this risk."

(6) Where a collateral arrangement counterparty becomes subject to insolvency proceedings, maximising the value of the insolvent entity's estate so that viable options for rehabilitation can be realised or ensuring the equitable distribution of that value among the entity's creditors upon a winding up.

A bifurcated framework for the provision of crypto-tokens as collateral

18.93 Such a legal framework in respect of crypto-tokens could apply to qualifying collateral arrangements that would include both title transfer and non-possessory security interest-based facilities.

18.94 To minimise the risk of collateral regime arbitrage by structurers of crypto-token related lending facilities, qualifying forms of collateral[1709] could be limited to those relating to crypto-tokens not otherwise capable of satisfying the definition of financial collateral under the FCARs.[1710]

18.95 The legal framework for crypto-token collateral arrangements in turn could be bifurcated, consisting of two rules-based frameworks that would be capable of iterative development in parallel:

(1) The first framework could apply to intermediated or "off-chain, custodial account based" crypto-token collateral arrangements where the crypto-token entitlements were represented by book entries in an internal register or internal account ledger (the "Book-Entry Framework").

(2) A separate parallel framework could then be developed for "on chain" crypto-token collateral arrangements that rely on technical features of (or of platforms or protocols built on) the network in which the relevant crypto-token collateral is instantiated (the "On-chain Framework").

18.96 The formulation of the detailed substantive provisions of any future crypto-token collateral regime is beyond the scope of this paper. However, we note below some issues that we consider are important in relation to crypto-tokens and the crypto-token markets that might deserve consideration and justify adopting a crypto-token specific approach.

Evidentiary requirements

18.97 Both a Book-Entry Framework and an On-Chain Framework could adopt similar approaches in principle to evidentiary requirements. Evidentiary requirements would need to be formulated to strike a balance between controlling fraud risk for parties to crypto-token collateral arrangements while at the same time supporting the use of innovative technologies and market efficiency. We anticipate that this could be

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[1709] And possibly qualifying obligations.

[1710] Development of such a regime may therefore not be possible to achieve without complimentary law reform in relation to the FCARs.

achievable by requiring qualifying collateral arrangements to be evidenced in writing or in a durable medium without the need for any statutory formalities.[1711]

18.98 As an example, future evidentiary requirements could be those that are most responsive to emerging trends and technologies in crypto-token networks. For example, for intermediated collateral arrangements, recorded telephone conversations could be sufficient.[1712] For on-chain collateral arrangements, a confirmed transaction on the relevant crypto-token network effecting a transfer to an escrow arrangement-controlling smart contract could do the same work. The statutory framework could also accommodate the emergence of future market and technological developments (as well as evolving standards for best practices in crypto-token lending markets) by encouraging and recognising guidance from expert industry panels. For example, such expert industry panels might be well-placed to provide guidance on the extent to which various communications and/or transaction records could satisfy evidentiary requirements.[1713]

Perfection

The role of factual control

18.99 As with evidentiary requirements, formulating perfection criteria for crypto-token collateral arrangements involves a balancing exercise, but this time with a focus on third party effects. If formal registration requirements are disapplied there needs to be an alternative method for ensuring the adequate publicity of collateral arrangements. Publicity minimises the risk of third-party transacting decisions and claims being undermined by an "invisibility of security interests", and of the value realisable by third parties being compromised by the existence of undisclosed priority security interests.[1714] However, this in turn would need to be framed in a way that encourages the adoption of innovative technology and supports market efficiency.

18.100 Crypto-token systems might usefully facilitate the creation and maintenance of arrangements that involve the manifestation of features (i) observable by potential third party creditors and (ii) that indicate the possible existence of proprietary claims in assets subject to those arrangements by parties other than their assumed or apparent owner. We think that such arrangements could potentially form a useful basis for developing a perfection test not based on registration.

18.101 As such a test would focus on the practical manifestation of observable features, we think that some form of factual control over crypto-tokens would also be an important

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[1711] We would therefore expect to disapply rules such as section 53(1)(c) LPA 1925, which requires "a disposition of an equitable interest…. subsisting at the time of the disposition must be in writing signed by the person disposing of the same, or by his agent thereunto lawfully authorised in writing or by will". For more detail on this issue, see Chapter 17.

[1712] The approach would be similar in principle to how the equivalent phrase has been interpreted in the context of the FCD. (See comment on FCD, art 1(5) in Section III.2 (ANALYSIS OF THE COMMON POSITION – Scope (Article 1)), Common Position (EC) No 32/2002 adopted 5 March 2002, OJ C 119 E/22 of 22 May 2002).

[1713] See also our proposals for encouraging and supporting the establishment of industry panels to develop responsive and clear legal frameworks for crypto-tokens and associated markets in Chapter 11 from para 11.129.

[1714] L Gullifer "What should we do about financial collateral?" [2012] 65 *Current Legal Problems* 377, 388 to 391.

constituent element of any perfection requirement applicable to any collateral arrangement they were subject to. This would be a different starting point to that adopted under the FCARs, which focuses instead on legal control as the core organising principle.[1715]

Incorporating factual control conceptions into a higher order "provision" principle

18.102 However, although we think factual control should be an important element of any perfection requirement, in our view it should not define that requirement.[1716] As noted above, crypto-token collateral arrangements can take many different forms in relation to which control may be distributed or facilitated through one or more third parties or even through or subject to conditions imposed by automated processes that operate independently of any party.

18.103 The level of control exercisable by any party to a collateral arrangement may be limited or qualified by the retention of some capacity for control by the other party. Attempting to accommodate the myriad configurations of a potential "practical manifestation" requirement within a principle defined in terms of control would we think introduce a degree of artificiality to the concept, stretching its boundaries beyond what would be intuitively understandable to market participants.

18.104 In considering control not as a defining principle in itself but as a constituent element of a higher-level framing concept for perfection requirements, we note that the perfection requirement under the FCD (but not the FCARs) can be understood as adopting a similar approach:

(1) The FCD framework "applies to financial collateral once it has been provided and if that provision can be evidenced in writing."

(2) "Provision" of financial collateral for the purposes of the FCD is explained as meaning "financial collateral being delivered, transferred, held, registered or otherwise designated so as to be in the possession or under the control of the collateral taker or of a person acting on the collateral taker's behalf."

(3) The FCD goes on to clarify that "Any right of substitution, right to withdraw excess financial collateral in favour of the collateral provider or, in the case of credit claims, right to collect the proceeds thereof until further notice, shall not prejudice the financial collateral *having been provided* to the collateral taker as mentioned in this Directive."[1717]

[1715] L Gullifer "What should we do about financial collateral?" [2012] 65 *Current Legal Problems* 377. As Professor Gullifer notes (at 391 to 392), "when thinking about … intangibles…what we actually are interested in is a badge of ownership (or of a lesser but proprietary interest) …if what we are interested in is the outward signs of an arrangement, one might have thought that operational [ie factual] control was more important than legal control."

[1716] We understand that ongoing analysis is being undertaken in the market as to whether and how to reform the FCARs. We understand the overarching purpose would be to introduce nuance, certainty, and clarity to the concept of control in its practical application to common collateral management practices within the confines of that statutory regime.

[1717] FCD, art. 2(2) (emphasis added).

18.105 The perfection requirement for the FCD therefore appears to have been defined in terms of "provision" of which control is (alongside possession) only a constituent element. This reading is reinforced by the fact that rights of withdrawal and substitution are expressed as not compromising the "provision" requirement, and not by reference to the impact of these rights on "possession or control".

18.106 This can be compared with the drafting of the equivalent clarification in the FCARs, which states that:[1718]

> Any right of the collateral-provider to substitute financial collateral of the same or greater value or withdraw excess financial collateral or to collect the proceeds of credit claims until further notice shall not prevent the financial collateral *being in the possession or under the control of* the collateral-taker.

The FCARs therefore omits the notion of "provision", elevating "possession or control" to being the primary principle *defining* perfection requirements and requiring all qualifications and clarifications to be stated by direct reference to that principle.

18.107 In developing a perfection requirement for crypto-token collateral we therefore consider that a useful starting point would be a framing approach similar to the FCD, developing a concept of "provision" as the core principle with control being merely a constituent element thereof. However, it is important to note that although the framing of the perfection principle would be similar to the FCD its substantive content (including the substantive content of the control concept that it incorporates) would be fundamentally different.

Incorporating a dynamic approach to defining "provision" and the recognition of evolving collateral management techniques and best practices

18.108 The concept of "provision" could therefore recognise current — and also retain the capacity to accommodate emerging — collateral holding patterns and collateral management techniques (particularly those specific to crypto-token markets). By limiting recognition to arrangements that were consistent with the frameworks' underlying objectives of supporting prudent risk management and encouraging stable and efficient crypto-token markets, the legal regime for crypto-token collateral could facilitate the adoption of best practices by market participants over time.

18.109 Guidance on the specific forms of different qualifying patterns (and associated best practices) could be set out in the relevant statutory instrument or developed over time by designated expert panels and/or the courts. Such guidance could be differentiated based on whether it was applicable to the Book Entry Framework or the On-chain Framework, or both. This would be necessary to address the fact that common holding structures and collateral management techniques may be specific to one framework only and may be reflective of both its particular limitations and particular capabilities.

[1718] FCARs, reg 3(1). *Re Lehman Brothers International (Europe)* [2012] EWHC 2997 at [101] (emphasis added).

Law reform in respect of the provision of crypto-tokens collateral arrangements

18.110 In this chapter we described the applicability of common law mechanisms for the creation of collateral arrangements over crypto-tokens. We then outlined some of the principal practical and legal limitations of those mechanisms. We then considered the extent to which the FCARs could or should be applied effectively to crypto-tokens. We concluded that there are many difficulties in effectively applying the FCARs to crypto-tokens.

18.111 We provisionally conclude that it is appropriate for further law reform to be undertaken in this area. We consider that it would be possible to create or adopt (through statutory law reform) a unified, comprehensive, and undifferentiated regime for financial collateral arrangements involving both traditional types of financial collateral and crypto-tokens. We also consider that an alternative approach would be to develop a bespoke regime for financial collateral arrangements in respect of crypto-tokens.

18.112 We are interested in feedback from market participants in this respect. Accordingly, while we do not make any specific proposals for law reform, we instead ask two open questions which are intended to encourage feedback and to develop market discourse on these complex and multi-faceted issues.

Consultation Question 39.

18.113 We provisionally conclude that it would be beneficial to implement law reform to establish a legal framework that better facilitates the entering into, operation, rapid, priority enforcement and/or resolution of crypto-token collateral arrangements. Do you agree?

If so, do you have a view on whether it would be more appropriate for any such law reform to aim to create: (i) a unified, comprehensive and undifferentiated regime for financial collateral arrangements involving both traditional types of financial collateral and crypto-tokens; or (ii) a bespoke regime for financial collateral arrangements in respect of crypto-tokens?

Chapter 19: Causes of action and remedies in relation to data objects

19.1 As we discuss in Chapter 5, we use the term data objects to describe those things that satisfy the criteria set out in that chapter, such that they fall within our proposed third category of personal property.[1719] Crypto-tokens, as discrete instantiations of data within a socio-technical system, are an important sub-set of data objects.[1720] This means that data objects (including crypto-tokens) are capable of being objects of personal property rights. But how does the law currently protect personal property rights in relation to different objects,[1721] and can these concepts neatly be applied to data objects including crypto-tokens?

19.2 This chapter discusses some of the causes of action and remedies that parties might pursue in the context of data objects, identifies some of the issues that might arise, and how a court might deal with these problems in practice.[1722] Our discussion considers how the existing law relating to various causes of action and associated remedies would apply to data objects under our proposed third category of property as if that category already exists. In other words, we approach the chapter on the basis that our law reform recommendations have been implemented. However, the current law already recognises the principal example of data objects — crypto-tokens — as objects of property rights (albeit not as part of a distinct third category of personal property). Therefore, we do not consider that our provisional proposals would have the effect of "elevating" crypto-tokens from a non-proprietary status to a proprietary status for the purposes of causes of action and associated remedies. Instead, this chapter investigates how existing causes of action and remedies that have traditionally applied to things in possession and things in action would apply to data objects. In the majority of cases, the current law does not distinguish between actions and remedies that apply to things in possession or things in action. However, in some cases it does. The primary example of this is the tort of conversion, but there are other distinctions and nuances that we highlight in this chapter.

19.3 This chapter asks consultees for their views on a number of these issues. The analysis that follows focuses predominately on crypto-tokens as a type of data object,

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[1719] See para 5.10 onwards.

[1720] See Chapter 10.

[1721] In this chapter, we sometimes use the term "property" as short-hand for "objects of property rights".

[1722] This chapter does not intend to be a comprehensive analysis of the entire law of causes of action and remedies potentially applicable to data objects. Instead, it focuses only on those causes of action and remedies which we consider to be the most relevant or which could give rise to novel legal questions in the context of data objects. For example, we do not discuss the doctrine of frustration on the basis that, even though data objects may give rise to new types of frustrating events, existing principles can (in our view) be applied in the same way as they currently are.

given their market prevalence and distinctive technological features that may give rise to novel questions in the context of causes of action and remedies.[1723]

BREACH OF CONTRACT

19.4 A party usually commits a breach of contract when it fails to perform the contract in accordance with its terms.[1724] Remedies for breach of contract can include the following:

(1) an award of damages;

(2) an award of an agreed sum;

(3) termination of the contract; or

(4) an order of specific performance, which compels the party in breach to perform its obligations under the contract.

19.5 Below, we briefly discuss these remedies, before considering their application to data objects.[1725]

Damages

19.6 "Unliquidated damages" refers to a sum of money determined by the court (that is, where the level of damages is not pre-agreed by the contracting parties). Unliquidated damages are payable to the aggrieved party in the event of a breach of contract.[1726] They are available as of right (in other words, they are not subject to the court's discretion).[1727]

19.7 Damages for breach of contract are almost always assessed on a compensatory basis.[1728] This means that they are designed to put the innocent party (so far as money can do) in the position it would have been in had the contract been performed according to its terms.[1729] Nonetheless, "nominal damages" may be awarded where

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[1723] As we discuss in Chapter 10, crypto-tokens are the primary sub-category of data objects that currently satisfy our proposed criteria.

[1724] A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 112.

[1725] We do not discuss all remedies for breach of contract (for example, termination) but rather the ones we think are most relevant to data objects, or which may give rise to novel legal questions.

[1726] H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 29-009.

[1727] *Morris-Garner v One Step (Support) Ltd* [2018] UKSC 20, [2019] AC 649 at [95] by Lord Reed. There are a variety of legal principles which govern the types of loss caused by the breach which may be compensated by an award of damages. For example, a certain type of loss may be said to be too "remote" if it would have been outside the reasonable contemplation of the parties at the time of contracting: see *Hadley v Baxendale* (1854) 9 Ex 341 and *Chitty on Contracts* (34th ed) para 29-126.

[1728] In exceptional cases, an account of profits for breach of contract may be awarded by reference to the gain made by the defendant as a result of the breach: see *Attorney-General v Blake* [2001] 1 AC 268, [2000] 3 WLR 625.

[1729] *Robinson v Harman* (1848) 1 Exch 850, 855. In seeking to put the claimant into as good a position as if the contract had been performed, there are different measures of compensation including the "difference in value", the "cost of cure" or (in some cases) damages designed to compensate the claimant for the loss of

the claimant has suffered no loss (or is unable to prove any loss) as a result of the defendant's breach of contract.[1730]

19.8 Parties to a contract may also agree that, in the event of a certain breach, the contract-breaker shall pay to the other party a specified sum of money. This kind of term is commonly described as a "liquidated damages" clause, as the sum payable constitutes the remedy stipulated by the parties in the event of a breach of a primary contractual obligation.[1731]

19.9 Liquidated damages clauses are enforceable irrespective of the loss actually suffered by the innocent party (whether less or greater),[1732] and are not therefore subject to limiting principles such as remoteness.[1733] Nonetheless, if the obligation imposed on the defaulting party is out of all proportion to the innocent party's legitimate interest in the performance of the contract, the clause will be held unenforceable on the basis that it constitutes a penalty.[1734]

The award of an agreed sum

19.10 The award of an agreed sum is a remedy which protects the claimant's expectations by enforcing the defendant's promise to pay a sum of money that is due under the contract.[1735] It directly enforces the debt owed under the contract.[1736] The remedy can be regarded as a hybrid insofar as it is common law-based and monetary in nature, but similar to specific performance in that its function is to compel performance of a positive contractual obligation.[1737]

19.11 The most important agreed sum, and the most common remedy for breach of contract, is the sum to be paid in return for the agreed contractual performance by the other party (commonly referred to as the "price").[1738] Examples include where a seller

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an economically valuable asset protected by the contract (generally known as "negotiating damages"). We do not discuss these concepts in detail in these chapter. For further information, see A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) pp 124 to 129, and A Burrows, *Remedies for torts, breach of contract, and equitable wrongs* (4th ed 2019) p 75.

1730 *Ashby v White* (1703) 2 Ld Raym 938.

1731 A Burrows, *Remedies for torts, breach of contract, and equitable wrongs* (4th ed 2019) p 388. An action for liquidated damages is generally considered an action for damages, rather than for a debt, since the trigger for payment is a breach of contract: *President of India v Lips Maritime Corp* [1988] AC 395 at 422 to 423, 424 (Lord Brandon), and *Chitty on Contracts* (34th ed 2021) para 30-002 n 10.

1732 *Clydebank Engineering and Shipbuilding Co Ltd v Don Jose Ramos Yzquierdo y Castaneda* [1905] AC 6. It follows that such clauses may also be designed to limit the defaulting party's liability (such terms sometimes being described as "underliquidated damages clauses"). See further: *Cellulose Acetate Silk Co Ltd v Widnes Foundry (1925) Ltd* [1933] AC 20.

1733 *Robophone Facilities Ltd v Blank* [1966] 1 WLR 1428, 1447 to 1448.

1734 *Chitty on Contracts* (34th ed 2021) para 29-203. For further detail, see *Cavendish Square Holding BV v Makdessi and Parking Eye Ltd v Beavis* [2015] UKSC 67, [2016] AC 1172.

1735 A Burrows, *Remedies for torts, breach of contract, and equitable wrongs* (4th ed 2019) p 381

1736 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 149.

1737 A Burrows, *Remedies for torts, breach of contract, and equitable wrongs* (4th ed 2019) p 381. The author includes liquidated damages in his discussion of agreed sums, although notes their distinction from an agreed price and other sums not payable on breach.

1738 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 149.

of goods sues for the price of the goods,[1739] or where a person who has done work sues for the agreed remuneration or bonus.[1740] An action for an agreed price seeks to recover the debt owed under the contract and is therefore also commonly referred to as an action in debt.[1741]

19.12 An action for the agreed sum has various advantages for a claimant when compared to a claim for unliquidated damages. These include[1742] that the innocent party need not prove any loss caused by the defendant's breach and the amount payable cannot be reduced for being too remote or because the innocent party has failed to mitigate their loss.

Specific performance

19.13 Specific performance is an equitable remedy which orders the defendant to perform their positive contractual obligation.[1743] Like other equitable remedies, specific performance is a discretionary remedy,[1744] and its availability remains subject to various limitations.

19.14 In general, specific performance will only be awarded where damages (and an award of an agreed sum) are inadequate.[1745] This may be the case because the subject matter of the contract is unique,[1746] or because damages would be financially ineffective.[1747] Goods or other objects of property rights are most obviously unique where substitutes cannot be bought in the market because the goods or property in

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1739 Sale of Goods Act 1979, s 49(1).

1740 *Société Générale v Geys* [2012] UKSC 63, [2013] 1 AC 523.

1741 A Burrows, *Remedies for torts, breach of contract, and equitable wrongs* (4th ed 2019) p 381. The concept of an action in debt can also extend to non-contractual demands for a certain sum of money based on unjust enrichment.

1742 *Chitty on Contracts* (34th ed 2021) para 30-002.

1743 *Chitty on Contracts* (34th ed 2021) para 30-017. Strictly speaking, it is not a prerequisite of specific performance that the defendant is in breach of contract. However, in practice, it is a breach of contract that renders it equitable to grant an award of specific performance.

1744 Although see *Co-operative Insurance Society Ltd v Argyll Stores (Holdings) Ltd* [1998] AC 1 at [11] by Lord Hoffmann, and A Burrows, *Remedies for torts, breach of contract, and equitable wrongs* (4th ed 2019) p 402, where the point is made that referring to specific performance as a discretionary remedy is a "misleading contrast".

1745 A Burrows, *Remedies for torts, breach of contract, and equitable wrongs* (4th ed 2019) p 402. Even if damages are inadequate, the court will not order specific performance if, for example, the contract is one for the provision of personal services, if the order would require constant supervision by the court, if performance would be physically or legally impossible, or if performance would entail severe hardship for the defendant: A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 156.

1746 For example, damages were an adequate remedy in the case of a contract for the sale of shares, as replacement shares could be bought easily in the market: *Cuddee v Rutter* (1720) 1 P Wms 570. However, the result would differ if the same number of substitute shares were not available in the market: *Harvela Investments Ltd v Royal Trust C of Canada (CI) Ltd* [1986] AC 207. Land generally is considered to be unique. It is also worth noting that the Sale of Goods Act 1979, s 52, allows for the court to grant specific performance with respect to specific or ascertained goods.

1747 This may include situations where, for example, damages are difficult to assess, where the defendant is unable to pay, where the defendant's obligation would be a continuing one, or where an award of damages would be purely nominal: *Beswick v Beswick* [1968] AC 58.

question exhibit specific characteristics that very few, if any, other goods have.[1748] Generally, the common law remedies (being monetary orders) are adequate where the breach is of a contractual obligation to pay money.[1749]

Application of the principles of breach of contract to data objects

19.15 As a general proposition, we see no reason why the existing principles of breach of contract cannot be applied to contracts concerning data objects in the same way as they are to contracts concerning any other object of property rights. The nature of the crypto-token, for example, will be relevant to determining whether a particular remedy is available on the facts, but (in our view) it does not necessitate or require any amendment to the principles that govern that remedy.

19.16 For example, if parties conclude a contract for the exchange of crypto-tokens, and one party fails to perform their obligation, the innocent party will, in principle, be able to bring a claim for damages or specific performance (depending on the facts). The claim will operate in the same way as if the contract were for the exchange of shares or some other object of property rights.[1750]

19.17 Similarly, parties could contractually agree that, if a certain obligation is breached, the defaulting party will be required to transfer a certain amount of crypto-tokens to the innocent party.[1751] If a dispute arose, a court would be required to consider whether such a clause is a penalty clause (and therefore unenforceable)[1752] and/or whether to grant relief from forfeiture[1753] in the ordinary way.

19.18 Data objects may, however, give rise to novel issues in relation to an action for the agreed sum. The question is whether it is possible under the existing law (or whether indeed it should be possible) to obtain an award of an agreed sum in circumstances where, for example, the obligation to be enforced is denominated in a specific crypto-

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1748 A Burrows, *Remedies for torts, breach of contract, and equitable wrongs* (4th ed 2019) p 404.

1749 Above p 409. Specific performance has, however, been ordered of a contract to pay an annuity: see *Ball v Coggs* (1710) 1 Bro Parl Cas 140; *Beswick v Beswick* [1968] AC 58.

1750 As discussed above at para 19.13, specific performance is an equitable remedy and is therefore not available for every breach of contract, since damages are likely to be an adequate remedy. Specific performance is however frequently awarded in the context of a breach of contract to sell land. See A Burrows, *Remedies for torts, breach of contract, and equitable wrongs* (4th ed 2019) p 403.

1751 Such clauses are generally referred to as other valid sanctions for breach, given that they cannot accurately be described as providing for liquidated damages. See A Burrows, *Remedies for torts, breach of contract, and equitable wrongs* (4th ed 2019) p 391.

1752 *Cavendish Square Holdings BV v Talal El Makdessi* [2015] UKSC 67; [2016] AC 1172, confirming that the law on penalties applies to clauses which require a party in breach to transfer property to the innocent party at less than its full value. See also *Jobson v Johnson* [1989] 1 WLR 1026, in which the law on penalties was applied to a clause to transfer shares, in the event of breach, rather than to pay money.

1753 *Shiloh Spinners Ltd v Harding* [1973] AC 691; *Cukurova Finance International Ltd v Alfa Telecom Turkey Ltd (No 4)* [2013] UKPC 25, [2015] 2 WLR 875. In *Cavendish Square Holdings BV v Talal El Makdessi* [2015] UKSC 67, [2016] AC 1172, Lords Mance and Hodge suggested that, where a clause falls within both the penalty and forfeiture doctrines, they should be applied sequentially and that even if the clause is not void as a penalty, the court could still grant relief against forfeiture (for example, by granting the defaulting party extra time to comply with the primary obligation breached). The point has not, however, yet been authoritatively decided: see *Chitty on Contracts* (34th ed 2021) para 29-273.

token. We discuss this below, and consider whether any particular law reform is required to accommodate data objects.

Action for the agreed sum

19.19 As discussed at paragraphs 19.10–19.12 above, an action for the agreed sum is a monetary remedy that is generally regarded as an action in debt rather than for damages. Discussions around whether crypto-tokens are money (or should be treated as money or analogous thereto) are complex and, as discussed in Chapter 13 and Chapter 18, are outside the scope of this consultation paper.[1754] However, suffice it to say that crypto-tokens denominated in their own notional unit of account are currently unlikely to count as (or be treated as) money in the same way as fiat currency.[1755] One reason for this is that crypto-tokens in this context (sometimes referred to as "crypto-currencies") are "self-anchored mathematic creatures" whose value depends on different structural and social concepts compared to existing fiat currencies.[1756] In addition, holding a crypto-token (such as bitcoin) in itself generates no right to exchange that token for legal tender.[1757]

19.20 In light of the above, we think that an action to enforce an obligation to "pay" non-monetary units such as crypto-tokens would, under the existing law, be characterised or construed as a claim for unliquidated damages for failure to deliver a commodity,[1758] rather than as a monetary debt. Support for this approach can be found in the courts' historical treatment of foreign currency. Since under the law of England and Wales foreign currency was, historically, not considered to be money, an action to enforce a foreign currency obligation was perceived by the court as an action for damages for breach of contract for failure to deliver a commodity or object of value.[1759]

1754 See para 13.50 and para 18.57.

1755 At least in England and Wales and other jurisdictions that have not adopted certain crypto-tokens as legal tender. See also D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.66. See, however, M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 7-027, where the point is made that: "There is no reason why bitcoin may not be regarded as a form of *private* money, given its exchange function, in the way that more tangible forms of private currency are money in this sense" (emphasis added).

1756 B Geva and D Geva, "Non-State Community Virtual Currencies" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 11-56.

1757 Again, at least in England and Wales and other jurisdictions that have not adopted certain crypto-tokens as legal tender. This is usually taken to refer to the banknotes or coins which constitute the national currency issued under the legislation of the State: S Green, "'It's Virtually Money" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 2.31-33. Professor Sarah Green is the Commissioner for Commercial and Common Law at the Law Commission of England and Wales, and lead Commissioner for this project.

1758 We discuss whether such awards could be denominated in crypto-tokens in more detail from para 19.159 below.

1759 See B Geva and D Geva, "Non-State Community Virtual Currencies" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 11.10, and *Re United Railways of the Havanas and Regla Warehouse Ltd* [1961] AC 1007. This position was, however, rejected in *Miliangos v George Frank (Textiles) Ltd* [1976] AC 443 in the context of foreign currency obligations.

19.21 Even though this result may be disadvantageous to claimants in some situations,[1760] we provisionally conclude that it is an accurate reflection of the current law, and do not propose any law reform or changes to existing principles. So we do not suggest developing the law to permit an action for an agreed sum to be brought in relation to crypto-tokens that are *not* considered to be money or analogous thereto. Instead, we think that such crypto-tokens should only be able to form the subject matter of such an award if and when they are considered money or analogous thereto. In other words, if and when (certain) crypto-tokens are treated in a general sense as money (or analogous thereto) there will be a legitimate basis for those crypto-tokens to be considered the subject matter of an award of an agreed sum, and therefore actionable in debt.

19.22 Without (certain) crypto-tokens being treated as money, developing the law to permit an action for the agreed sum in relation to certain crypto-tokens is, in our view, undesirable. Such an approach would be contrary to the well-established principles of remedies that an action to enforce a debt applies in relation to a definite sum of money. In addition, infringements of rights in relation to other objects of property rights are generally addressed either through a claim in damages or through an award of specific performance at equity. Relatedly, enforcing an award of an agreed sum where the subject matter is arguably non-monetary would, in our view, be tantamount to ordering specific performance of a non-monetary obligation as of right. This would be contrary to the existing legal position where awards of specific performance are subject to limitations as part of the court's equitable jurisdiction.

19.23 We recognise that this reasoning could have potentially significant consequences, particularly in situations involving insolvency. For example, a person might conclude a transaction of sale with a counterparty on terms that payment will be made in crypto-tokens. If the counterparty becomes insolvent before the execution of the contract, a question will arise as to the proper characterisation of the crypto-tokens for the purposes of the creditors' claim.[1761] If as we provisionally conclude, the claim would be characterised as a claim for unliquidated damages based on breach of contract to deliver a commodity, then the assessment of the value of the loss might not necessarily be made as at the onset of insolvency. However, a party might argue instead that the claim should be characterised as an action for the price (denominated in the relevant crypto-token). If it was, then that action for the price (denominated in the relevant crypto-token) might be analogous with a foreign debt claim. It therefore

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[1760] As Professor Green observes: "the principal consequence for a disappointed seller, having agreed to accept bitcoin, would seem to be remedial, since she thereby loses the ability to sue for the price. This denies the seller the ability to enforce the primary obligation, and its corresponding advantages: debt claims are not discretionary, nor are they subject to the common law constraints of remoteness, mitigation, or penalties, and it is both procedurally and substantively easier for debt claimants to obtain summary judgment". S Green, "It's Virtually Money" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 2.43. Professor Sarah Green is the Commissioner for Commercial and Common Law at the Law Commission of England and Wales, and lead Commissioner for this project.

[1761] This example was given by Mr Justice Zacaroli in a lecture delivered to the Insolvency Lawyers Association on 17 October 2019, reproduced in *South Square Digest* (November 2019) at https://southsquare.com/wp-content/uploads/2019/11/Digest-Nov-2019.pdf.

would need to be converted into the currency in which the insolvency estate was to be administered before any distribution could be calculated and made.[1762]

19.24 As Mr Justice Zacaroli observed:[1763]

> Given the volatility of [some] crypto-tokens and the fact that the valuation of the claim may well depend on a different date in either case, the difference between treating it as a foreign currency claim, or as a damages claim for failing to deliver a commodity could be enormous.

19.25 We are interested in consultees' views on this issue and our provisional conclusion.

Consultation Question 40.

19.26 We provisionally conclude that an action to enforce an obligation to "pay" non-monetary units such as crypto-tokens would (and should) be characterised as a claim for unliquidated damages, unless and until crypto-tokens are generally considered to be money (or analogous thereto). Do you agree?

VITIATING FACTORS

The general law

19.27 The law of England and Wales recognises various factors that render a contract defective. These are known as "vitiating factors". They include mistake, misrepresentation, duress and undue influence.

19.28 If a vitiating factor is established, then, depending on the particular factor in question, the contract may be "void" or "voidable".[1764] If a contract is "void", it is treated as though it never existed. An example of a vitiating factor that renders a contract void is mistake, which we discuss below. If a contract is "voidable", then it remains valid unless and until it is "rescinded" by the party who has the power to do so. The effect of rescission is that the contract is set aside from the start.[1765] Examples of vitiating factors that render a contract voidable include misrepresentation, duress, and undue influence.

[1762] See rule 14.21 Insolvency Rules 2016: "(1) A proof for a debt incurred or payable in a foreign currency must state the amount of the debt in that currency. (2) The office-holder must convert all such debts into sterling at a single rate for each currency determined by the office-holder by reference to the exchange rates prevailing on the relevant date."

[1763] Mr Justice Zacaroli in a lecture delivered to the Insolvency Lawyers Association on 17 October 2019, reproduced in *South Square Digest* (November 2019) at https://southsquare.com/wp-content/uploads/2019/11/Digest-Nov-2019.pdf.

[1764] A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) pp 178 to 179.

[1765] The term "rescission" is also sometimes used to describe the termination of the contract with prospective effect. However, today, the term is more commonly used to describe the retrospective setting aside or wiping away of the contract: see *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) para 40-02.

19.29 We briefly summarise each vitiating factor below. However, we do not think contracts involving data objects raise any particularly novel issues as regards the application of the existing legal principles of vitiating factors.[1766] We then turn to consider the remedies that might be awarded if such a contract is void or has been set aside because of the presence of a vitiating factor, and consider the application of those remedies in the context of data objects.

Mistake

19.30 A contract can be rendered void if one or both parties laboured under a mistake when entering into the contract. A "mistake" can be described as an erroneous belief or assumption about a matter of fact or law.[1767] A mistake made by both parties is known as a "common mistake" and a mistake made by one party is known as a "unilateral mistake".[1768]

Misrepresentation

19.31 Under the law of England and Wales, a contract is vitiated if a party was induced to enter into the contract by a misrepresentation made by the other party. A "misrepresentation" can be defined as a false representation, by words or conduct, about a matter of fact or law.[1769] A misrepresentation can be fraudulent,[1770] negligent,[1771] or innocent.[1772] Where misrepresentation is established, the contract is generally voidable: the claimant has the power to rescind the contract.[1773] Where the claimant has suffered loss as a result of entering into the contract, the claimant may be entitled to damages under tort law,[1774] or under the Misrepresentation Act 1967.[1775]

[1766] We do however briefly discuss some practical difficulties that could arise in the context of rescission, from para 19.39 below.

[1767] *Chitty on Contracts* (34th ed 2021) para 5-001; *Pitt v Holt* [2013] UKSC 26, [2013] 2 WLR 1200 at [108] to [109] by Lord Walker.

[1768] *Chitty on Contracts* (34th ed 2021) para 5-001. Note, however, that not all mistakes will render a contract void, but only fundamental mistakes: see *Chitty on Contracts* (34th ed 2021) para 5-008.

[1769] Whether a representation is "false" depends upon how the words or conduct would be understood by a reasonable person in the factual context: *Chitty on Contracts* (34th ed 2021) para 9-006; *IFE Fund SA v Goldman Sachs International* [2006] EWHC 2887 (Comm), [2007] 1 Lloyd's Rep 264 at [50] by Toulson J.

[1770] Where the party making the representation knows that it is false or is reckless as to whether it is true or false: *Derry v Peek* (1889) 14 App Cas 337.

[1771] Where the party making the representation did not have reasonable grounds for believing it to be true: *Hedley Byrne & Co Ltd v Heller & Partners Ltd* [1964] AC 465; *Esso Petroleum Co Ltd v Mardon* [1976] QB 801.

[1772] Where the party making the representation was neither fraudulent nor negligent.

[1773] Where a consumer has been induced by a misrepresentation made by a trader to enter into a contract, the misrepresentation may amount to an "unfair commercial practice" under the Consumer Protection from Unfair Trading Regulations 2008, SI 2008 No 1277, and the consumer may be entitled to unwind the contract or claim damages. In cases of non-fraudulent misrepresentation, the court also has a discretion to refuse rescission and order damages in lieu if it considers "that it would be equitable to do so", having regard to the nature of the misrepresentation, the loss caused to the claimant if the contract were upheld, and the loss that rescission would cause to the defendant: Misrepresentation Act 1967, s 2(2).

[1774] The tort of deceit (in the case of fraudulent misrepresentation) or the tort of negligence (in the case of negligent misrepresentation).

[1775] Misrepresentation Act 1967, s 2(1).

Duress and undue influence

19.32 A contract is vitiated for duress where a party was induced to enter into the contract by an illegitimate threat made by the other party.[1776] Where it is proven that, but for the illegitimate threat, the claimant would not have entered into the contract, the claimant can rescind the contract.[1777] A contract can also be vitiated where a party enters into a contract under the undue influence of the other party. Undue influence arises in situations where, because of the relationship between the parties, the claimant is unable to exercise free and independent judgement when entering into the contract.[1778]

Remedies where the contract is void or has been vitiated

Remedies where the contract is void

19.33 A void contract entails that there is no legal relationship between the parties. As such, a void contract produces no legal effects whatsoever.[1779] Generally, any objects of property rights transferred or payments made under a void contract are recoverable.

19.34 Where goods or other objects of property rights are transferred pursuant to a void contract, title to the property generally does not pass to the transferor.[1780] If goods or other tangible property have been delivered to the defendant, they may be recoverable through an action in the tort of conversion.[1781]

19.35 However, title in money generally passes despite a void contract.[1782] Where the claimant no longer retains title to the money, there are no proprietary consequences for the void contract. Instead, the innocent party may have a personal restitutionary claim for the value of the benefit transferred under the law of unjust enrichment.[1783]

Remedies where the contract is voidable

19.36 Until a voidable contract is rescinded, the contract is fully effective and binding, and the transferee has full legal and beneficial interests in the property transferred

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1776 *Pakistan International Airline Corporation v Times Travel (UK) Ltd* [2021] UKSC 40, [2021] 3 WLR 727 at [62] by Lord Burrows.

1777 Above.

1778 *Royal Bank of Scotland v Etridge (No 2)* [2001] UKHL 44, [2002] 2 AC 773.

1779 *Chitty on Contracts* (34th ed 2021) para 1-074.

1780 *Cundy v Lindsay* (1878) 3 App Cas 459, 466 by Lord Cairns LC; *Benjamin's Sale of Goods* (11th ed 2021) para 16-092.

1781 *Chitty on Contracts* (34th ed 2021) para 1-074. Note that at common law, it is generally not possible to compel the return of property in kind: *Re Diplock* [1948] Ch 465. However, there is a discretion for the court to make an order for the return of a chattel under the Torts (Interference with Goods) Act 1977, s 3.

1782 *Westdeutsche Landesbank Girozentrale v Islington London Borough Council* [1996] AC 669, 689 to 690 by Lord Goff who says that "there is no general rule that the property in money paid under a void contract does not pass to the payee", and at 703 by Lord Browne-Wilkinson, who makes the point that title to money is extinguished when the money is paid into a mixed bank account. See also *Hanbury & Martin: Modern Equity* (22nd ed 2021) paras 26-010 to 26-011. We also discuss the common law special defence of good faith purchaser for value without notice (which creates a fresh, indefeasible title in a transferee who receives money in good faith and for value) in more detail in Chapter 13.

1783 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 179. We discuss the elements of a claim in unjust enrichment in more detail from para 19.77 below.

pursuant to it.[1784] The claimant's right to rescind has a proprietary effect in that it is capable of being exercised against third-party transferees, unless the third party has acquired either legal or equitable interests in the property for value and without notice of the claimant's mere equity.[1785] Where a contract is rescinded in equity, the property transferred under the contract is held on constructive trust by the transferee pending its return to the transferor.[1786]

19.37 If a claimant elects to rescind, the contract is set aside from the start and the parties are restored to the position they were in before the contract was made.[1787] Rescission does not necessarily require an order from the court. In some cases, a party can rescind a contract simply by informing the other party that the contract is rescinded, or, where that is not possible, by making clear through any other act that the contract is rescinded.[1788] In practice, however, if the claimant's entitlement to rescind the contract is disputed by the other party, the court will need to decide the matter. The court's assistance may also be required to facilitate the unwinding of the contract.

19.38 As the purpose of rescission is to unwind the contract, the right to rescind cannot be exercised unless the parties can be restored to their pre-contractual positions.[1789] Traditionally, courts enforced this requirement strictly, so that, unless the performance of the contract could literally be unwound, rescission was barred and the contract remained valid.[1790] However, the modern approach is to permit rescission so long as the court can achieve "practical justice" between the parties, and that restoration to

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1784 M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 15-115.

1785 *Westminster Bank Ltd v Lee* [1956] Ch 7; M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 15-115.

1786 M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 15-116. The authors make the point that, following rescission at equity, the transferor would be able to exercise their rights to call for the legal title to be transferred to them, thereby unwinding the transaction. Where the rescission is at law, however, legal title will be revested in the transferor immediately upon the exercise of the right without the intervening period of trusteeship. See also B Haecker, "Proprietary restitution after impaired consent transfers: a generalised power model" (2009) 68(2) *Cambridge Law Journal* 324. The author argues that proprietary restitution after impaired consent transfers (such as mistaken transfers) should always take the form of a power (which has to be exercised before any property right revests), even where the transferor has a fully-fledged personal claim to restitution.

1787 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) pp 179 to 180.

1788 The right to rescind a contract for fraudulent misrepresentation and duress arises at common law, and does not require an order from the court. In contrast, the right to rescind a contract for non-fraudulent misrepresentation or undue influence arises in equity. The authorities are unclear on whether a contract can be rescinded in equity by an election by the claimant, or only by an order of the court: see *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) paras 40-11 to 40- 12.

1789 There are other bars to rescission. These include: (1) where the claimant, despite becoming aware of the vitiating factor, decides to affirm the contract; (2) where there has been such a delay by the claimant in seeking rescission that it would be unjust to permit rescission; and (3) where property transferred under the contract has been purchased by a third party, without notice of the vitiating factor rendering the contract voidable. In cases of non-fraudulent misrepresentation, the court also has a discretion to refuse rescission and order damages in lieu if it considers "that it would be equitable to do so", having regard to the nature of the misrepresentation, the loss caused to the claimant if the contract were upheld, and the loss that rescission would cause to the defendant: Misrepresentation Act 1967, s 2(2).

1790 See for example, *Clarke v Dickson* (1858) EB & E 148, where the claimant was refused rescission of a contract to purchase shares in a partnership, because the partnership had been converted into a limited liability company, making it impossible for the claimant to return shares "in a partnership" to the defendant.

the parties' pre-contractual positions should be "substantial rather than precise".[1791] For example, while it is not possible to "return" a person's time and labour, they can be reimbursed for it with a money payment.

Application of the principles of vitiating factors to data objects

19.39 If the claimant transfers a data object to the defendant as a result of a misrepresentation or undue influence by the defendant, we think the contract is likely to be voidable in the same way as if any other object of property rights had been transferred to the defendant.[1792] The effect of rescission at equity will be that the property will be held on constructive trust by the defendant for the claimant, pending its return.[1793]

19.40 Even though we think the legal principles of rescission can be applied to data objects in the same way as they are to other objects of property rights, it is possible that practical issues might arise in the context of achieving rescission where data objects are concerned. This is because once a transaction has taken place on an (effectively) immutable crypto-token system, it is practically impossible to unwind those transactions and to restore the parties to their pre-contractual positions. Despite this, there may be other ways in which the court could achieve "practical justice" between the parties. There are several options available:[1794]

(1) The court could order the parties to enter into an "equal and opposite" second transaction on the crypto-token system. The first transaction would remain recorded as a state change to the system, but its effects would be reversed by the second transaction.

(2) The court could identify the benefits transferred, value those benefits in money, and then order the parties to make restitution to each other of the value of those benefits. While the precise benefits transferred (for example, a crypto-token transferred by Alice to Bob) would not be restored, the value of those benefits would be, so that practical justice is achieved between the parties.

19.41 Even if the remedy is not rescission in a strict legal sense, in practical terms the result is the same, and we think this may well be sufficient in the majority of cases. The precise nature of the order fashioned by the court will likely depend on various factors, including the type of crypto-token, the system in question and any relevant third parties who have the power to reverse transactions (for example, a central administrator in a permissioned system).

[1791] *Chitty on Contracts* (34th ed 2021) para 9-133; *O'Sullivan v Management Agency and Music Ltd* [1985] QB 428.

[1792] Misrepresentation Act 1967, s 2(2), which specifies that where a person is entitled to rescission (on the basis of misrepresentation that is not fraudulent), then the court has the discretion to award damages in lieu of rescission.

[1793] Prior to this point, the claimant has a "mere equity" to rescind: see para 19.36 above. There is some authority to the effect that the property is held on resulting trust: *El Ajou v Dollar Land Holdings Plc* [1993] 3 All ER 717 at 734 by Millett J, although nothing turns on the distinction in practice.

[1794] N Yeo and A Taylor, "Avoiding blockchain contracts" (2019) 9 *Butterworths Journal of International Banking and Financial Law* 586.

19.42 Similarly, where a contract involving a data object is void for mistake, there is no reason why the ordinary rules following recovery of objects of property rights transferred under a void contract should not apply. For example, we think the claimant would, in principle, be able to bring a proprietary restitutionary claim for the value of the property received by the defendant (provided they retain legal title and can follow or trace the property).[1795] Alternatively (and possibly dependent on whether legal title has transferred despite the void contract)[1796] the claimant could bring a claim in unjust enrichment to recover the value of the data object.[1797] Conversion is not applicable under the current law given that data objects are not capable of possession.[1798]

FOLLOWING AND TRACING

The general law

19.43 Following and tracing are evidential rules concerned with establishing what has happened to an object of property rights in which a claimant has a legal or equitable interest.[1799] The purpose of following and tracing is to enable the claimant to locate and identify their object of property rights (or its proceeds or substitute) through a series or chain of transactions, with the overarching aim of establishing a proprietary claim against that property.[1800] Such a claim could be for a proprietary remedy in respect of the object of property rights itself (or its proceeds or substitute), or a personal (monetary) remedy against the defendant who received the property for the value thereof.[1801]

19.44 The essence of following is that the claimant is able to show that the actual object in which they have a proprietary interest has been received by the defendant.[1802] If the identity of the claimant's object has been lost or the object has been destroyed, the

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1795 We discuss proprietary restitutionary claims at law in more detail from para 19.70 below and following and tracing from para 19.43. We also discuss the law on derivative transfer of title in Chapter 13.

1796 See the discussion on title and unjust enrichment claims from para 19.77 below.

1797 We discuss unjust enrichment in the context of data objects, and in particular in the context of void contracts, in more detail from para 19.33 below. Whether a claimant brings a claim in unjust enrichment or proprietary restitution would depend on the facts, including whether the property is in the hands of an indirect recipient where it is traditionally more difficult to establish unjust enrichment.

1798 We discuss conversion in the context of data objects in more detail from para 19.89 below.

1799 Technically speaking therefore, they are not themselves remedies; rather, they facilitate or permit a claimant to assert their right to other remedies (such as proprietary restitution).

1800 *Foskett v McKeown* [2001] 1 AC 102, 127 by Lord Millett.

1801 See G Virgo, *The Principles of the Law of Restitution* (3rd ed 2015) p 557 for a discussion on terminology in this context. As the author notes, all restitutionary claims which are founded on the claimant's proprietary rights are properly classified as proprietary claims, since they are dependent solely upon the identification and protection of proprietary rights. But the remedies are not necessarily proprietary remedies, since, depending on the particular circumstances of the case, the appropriate remedy may be either proprietary or personal. See also *Trustee of the Property of FC Jones and Sons (a firm) v Jones* [1997] Ch 159 at 168 by Millett LJ for a brief mention of the distinction between proprietary claims and proprietary remedies.

1802 *Foskett v McKeown* [2001] 1 AC 102, 127 by Lord Millett.

claimant will no longer be able to follow it.[1803] Where the claimant transfers the object directly to the defendant there is little difficulty in following it.

19.45 In some circumstances (where, for example, the original objects of property rights cannot be followed) it is necessary for the claimant to show that the value of the property in which they originally had a proprietary interest can be identified in (or "traced" to) property that has been received by the defendant.[1804] The rules on tracing enable the claimant to identify substitute property in the defendant's hands which the claimant had not previously owned, but which can be considered to represent the claimant's original property.[1805]

19.46 The rules on tracing at common law differ from (and are relatively more restrictive than) those at equity. At common law, the traditional approach has been that tracing to a substitute is only possible where the substitute property is readily identifiable and has not been mixed with other property so that it loses its identity.[1806] Where money has been mixed with other money, tracing at common law has therefore traditionally failed.[1807] Nonetheless, the distinction between the rules of following and tracing at common law and in equity has been the subject of persuasive judicial and academic criticism. For instance, in *Foskett v McKeown,*[1808] both Lord Steyn and Lord Millett favoured the view that "following and tracing should be treated as a single analytical process, with the distinction between common law and equity relevant only to the claim in support of which that process is invoked.".[1809]

1803 At common law, a claimant can follow their property into a mixture, for example if their cotton bales (*Spence v Union Marine Insurance Co Ltd* (1868) LR 3 CP 427) or oil (*Indian Oil Corp Ltd v Greenstone Shipping SA (Panama)* [1988] QB 345) are mixed with another's, provided that it is possible to separate the components of the product. However, the usual view is that, at common law, a claimant cannot follow or trace money through a mixture (*Agip (Africa) Ltd v Jackson* [1990] Ch 265, 286 by Millett J, upheld [1991] Ch 547 at 566 by Fox LJ; *Snell's Equity* (34th ed 2019) para 30-053), although Professor Smith has previously argued to the contrary: L Smith, *The Law of Tracing* (1997) pp 71, 162 to 74.

1804 *Foskett v McKeown* [2001] 1 AC 102 at 128 by Lord Millett. See also T Cutts, "Tracing, Value and Transactions" (2016) 79 *Modern Law Review* 381, which presents challenges to the view that tracing should be understood as the process of following value through one or more substitutions.

1805 *Foskett v McKeown* [2001] 1 AC 102 at 128 by Lord Millett; G Virgo, *The Principles of the Law of Restitution* (3rd ed 2015) p 608.

1806 *Trustee of the Property of FC Jones v Jones* [1997] Ch 159, 169 by Millett LJ. It has been said that tracing at common law is only possible where there is a "clean substitution": A Burrows, *The Law of Restitution* (3rd ed 2011) p 123. Examples of clean substitutions are the exchange of a car for a boat, or a cow for a goat. See also G Virgo, *The Principles of the Law of Restitution* (3rd ed 2015) p 615, where the point is made that: "Where there has been an irretrievable mixing it is simply not possible to say in what property the claimant has a proprietary interest. Consequently, where such mixing has occurred, the claimant's legal title to the property will be extinguished".

1807 *Trustee of the Property of FC Jones v Jones* [1997] Ch 159, 168 by Millett LJ. However, some case law has held that when money is withdrawn from a bank account, thus converting the chose in action (the bank account debt) into money, a claimant might be able to trace at common law from the bank account into the money: *Lipkin Gorman v Karpnale Ltd* [1991] 2 AC 548.

1808 *Foskett v McKeown* [2001] 1 AC 102, 113 by Lord Steyn, and 128 to 129 by Lord Millett.

1809 T Grant, D Mumford, *Civil Fraud: Law, Practice & Procedure* (1st ed) para 23-008. See further: P Birks, "The Necessity of a Unitary Law of Tracing", in R Cranston (ed) *Making Commercial Law, Essays in Honour of Roy Goode* (1997) pp 239 to 258; L Smith, *The Law of Tracing* (1997); J English, M Hafeez-Baig, *The Law of Tracing* (2021).

Application of following and tracing to data objects

19.47 As we discuss in Chapter 12, we do not think that transfers of crypto-tokens should be characterised as transfers of an unchanging thing.[1810] In crypto-token systems, data parameters associated with the data objects necessarily change as part of the transfer process. This means that the data structures of manifested data are necessarily different pre- and post- transaction, such that they are distinct and different data objects. Accordingly, we note that the proper characterisation of such transactions entails the acquisition of a new, modified or causally-related thing by the transferee.

19.48 Given the changing form of the crypto-token as state changes are effected, the question that arises is whether the law of tracing or the law of following is most appropriate where crypto-token transfers are concerned. Following involves "the same asset as it moves from hand to hand".[1811] Since crypto-tokens cannot be considered the "same" thing when they are transferred on crypto-token systems, the law of following is likely to be of little relevance in the context of crypto-tokens. Instead, we think that the law of tracing is the more appropriate starting point.[1812] This view is reinforced by the fact that the court has recently ordered a third party to disclose information that would enable the claimant to trace crypto-tokens (such as bitcoin).[1813]

19.49 The question that then arises is whether the common law and equitable tracing rules can be applied to data objects such as crypto-tokens, or whether reform of the rules is required. Since the rules on tracing at equity are more generous than at common law (for example, equitable tracing is not defeated by mixing),[1814] we do not think any reform of these rules at equity is required. However, tracing at common law is comparatively more restrictive. A claimant would only be able to successfully trace their crypto-token at common law if they could establish that the "new" crypto-token is a substitute for the claimant's property that is readily identifiable, and which has not been mixed with other property such that its identity is lost.

1810 UK Jurisdiction Taskforce, *Legal statement on cryptoassets and smart contracts* (2019) para 45; See also D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.53: "unlike a physical coin that passes as a continuing thing from payer to payee, the object of the cryptocurrency payment is not the same thing on either side of the payment transaction.".

1811 *Foskett v McKeown* [2001] 1 AC 102, 127 by Lord Millett.

1812 For a consideration of the courts' application of tracing principles to cases involving the acquisition of an asset by one person, and the loss of an asset by another person, see T Cutts, "Dummy Asset Tracing" (2019) *Law Quarterly Review* 135, 140 to 165.

1813 See *Mr Dollar Bill Limited v Persons Unknown and Others* [2021] EWHC 2718 (Ch), [2021] All ER (D) 67 (Aug), where the court granted *Norwich Pharmacal* and *Bankers Trust* orders to facilitate tracing to determine what happened to the bitcoin which was allegedly the subject matter of fraud. We note that there may be practical difficulties in tracing where the identities of the parties are unknown.

1814 *Re Hallett's Estate* (1880) 13 Ch D 696; *Sinclair v Brougham* [1914] AC 398; *Agip (Africa) Ltd v Jackson* [1991] Ch 417.

19.50 Whether tracing is available in a given case will depend on the facts.[1815] We think it is at least arguable that a "new" crypto-token created upon a state change in a crypto-token system could be considered a "clean substitute" for the claimant's original property, which is readily identifiable. When this is the case, we see no reason why a tracing exercise at common law would fail. Nonetheless, we acknowledge that some transfers will involve crypto-tokens becoming "mixed"[1816] as they are transferred. We also agree with the criticisms of the restrictive nature of the common law rules of tracing (more generally) articulated by Lords Millett and Steyn in *Foskett v McKeown*.[1817] For this reason, we are interested in consultees' views on whether the common law on tracing into a mixture could helpfully be developed (whether generally or specifically in relation to crypto-tokens).

19.51 Once a claimant has established what has become of the object of their property rights, they may bring a proprietary claim (either at equity or at common law, depending on their proprietary interest in the property), for a suitable (proprietary or personal) remedy. For example, the claimant might be able to bring a proprietary claim at equity and assert that traceable substitute property is held for them on constructive trust, or that the defendant must pay the value of the property received in an action for knowing receipt. Equitable proprietary claims are generally preferable to common law claims given that the equitable rules on tracing are more generous and enable the claimant to obtain a proprietary remedy. We discuss proprietary claims in equity and associated remedies, as well as the possibility of a proprietary restitutionary claim at law, below.

[1815] See D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) from para 6.67 for a discussion of tracing and mixing in relation to certain crypto-tokens.

[1816] This is particularly the case with Account-Based tokens and crypto-tokens based on "fungible" token standards, although it is perhaps less likely with UTXO-Based tokens. See D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.76, where the point is made that: "the unique transactional history recorded in some crypto-coins, such as Bitcoins, may mean that it can never be mixed in an absolute sense".

[1817] See para 19.46, above. We understand that if the tracing rules were assimilated, it would follow that, regardless of whether the proprietary base is legal or equitable, the claimant would be able to trace through a mixed fund. However, assimilation of the tracing rules would not result in the assimilation of the rules on claiming or remedies. For example, if a thief or fraudster "stole" a crypto-token which was irretrievably mixed with other crypto-tokens, if the tracing rules were not changed, the mixing would defeat the claim at law, since legal title to the mixture would have passed to the thief. If tracing into a mixture were possible at law, the victim would still retain legal title to the crypto-token in the mixture, and would be able to bring a proprietary claim at law (although common law remedies to vindicate property rights are essentially limited to personal remedies). See G Virgo, *The Principles of the Law of Restitution* (3rd ed 2015) p 629.

Consultation Question 41.

19.52 We provisionally conclude that tracing (rather than following) provides the correct analysis of the process that should be applied to locate and identify the claimant's property after transfers of crypto-tokens by a transfer operation that effects a state change, and that the existing rules on tracing (at equity and common law) can be applied to crypto-tokens. Do you agree?

19.53 Do you consider that the common law on tracing into a mixture requires further development or law reform (whether generally or specifically with respect to crypto-tokens)?

BREACH OF TRUST AND OTHER EQUITABLE WRONGS

The general law

19.54 As discussed in Chapter 16, we consider that data objects such as crypto-tokens are appropriate objects of property rights which may be held on trust. A trustee will be held liable for a breach of trust if they "wrongfully exceed the equitable authority conferred upon [them] by the trust instrument or by the general law".[1818] An example would be where a trustee engages in unauthorised investments or distributions of trust property.[1819] Claims for breach of trust may give rise to personal or proprietary remedies.[1820]

19.55 Crypto-tokens may also be dealt with by fiduciaries (such as company directors) on behalf of those to whom they owe their duties.[1821] A breach of fiduciary duty typically arises in circumstances where the fiduciary abuses their position of trust for their own advantage and/or places themselves in a position in which their duty conflicts with their personal interests, without first obtaining informed consent from their principal.[1822]

1818 *Snell's Equity* (34th ed 2019) para 30-001.

1819 Above. A wide range of property is capable of being the subject-matter of a trust. In *Lord Strathcona Steamship Co Ltd v Dominion Coal Co Ltd* d [1926] AC 108, 12 the Privy Council held that: "The scope of the trusts recognised in equity is unlimited. There can be a trust of a chattel or of a chose in action, or of a right or obligation under an ordinary legal contract, just as much as a trust of land".

1820 M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 36-023.

1821 In *Tulip Trading Limited v Bitcoin Association for BSV* [2022] EWHC 667 (Ch), the claimant unsuccessfully sought to compel the defendant developers to write software "patches" to help him recover control over crypto-tokens lost in a computer hack. The High Court dismissed the claimant's submission that the software developers (said to be) in control of the Bitcoin network might owe fiduciary duties to the owners of bitcoin (at [53] to [83]).

1822 See *Bristol & West Building Society v Mothew* [1998] Ch 1, 18 by Millett LJ: a fiduciary may be described as "someone who has undertaken to act for or on behalf of another in a particular matter in circumstances which give rise to a relationship of trust and confidence". In some categories of relationship there is a strong presumption that fiduciary duties are owed: solicitors owe fiduciary duties to their clients (*Nocton v Lord Ashburton* [1914] AC 932), company directors owe fiduciary duties to their company (s 175 Companies Act

19.56 This section provides an overview of the some of the equitable remedies for breach of trust, breach of fiduciary duty, and dishonest assistance, before considering how they might be applied to cases involving data objects such as crypto-tokens.

Proprietary remedies for breach of trust or fiduciary duty

19.57 Proprietary remedies, where available, have multiple potential advantages for claimants.

(1) First, if the property has increased in value, a claimant can claim the trust property itself to secure this benefit for themselves. Where, however, the trust property has diminished in value, they can elect instead to claim an equitable lien over the trust property or its proceeds to secure the personal liability of the trustee,[1823] fixed at the value when the defendant first received the property.[1824]

(2) Second, establishing a trust helps to protect a claimant against the risk that the defendant might become bankrupt or insolvent, as property held on trust does not form part of the defendant's estate.[1825]

19.58 Beneficiaries of a trust generally have a continuing beneficial interest in misapplied trust property and its traceable proceeds.[1826] This proprietary right is superior to the rights of (and therefore binds) any person who acquires the property or its traceable proceeds,[1827] except a good faith purchaser for value without notice of the beneficiaries' equitable interest (sometimes known as "equity's darling"). In commercial transactions, a purchaser may be regarded as having notice of an equitable interest. Examples are where they have failed to draw inferences which ought reasonably to have been drawn in that context; or where they have been put upon inquiry by suspicious circumstances indicative of wrongdoing by the transferor, but have failed to make reasonable inquiries.[1828]

19.59 Additionally, in certain circumstances, claimants may be able to take advantage of a constructive trust imposed on trustees and other fiduciaries to prevent them from profiting out of their position. For example, a fiduciary who receives a bribe or secret commission in breach of fiduciary duty will hold that profit on constructive trust for their

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2006; *Regal (Hastings) Ltd v Gulliver* [1967] 2 AC 134), and agents owe fiduciary duties to their principals (*FHR European Ventures LLP v Cedar Capital Partners LLC* [2014] UKSC 45, [2015] AC 250). It is not the case that all fiduciaries owe the same duties in all circumstances (*Henderson v Merrett Syndicates* [1995] 2 AC 145, 206 by Lord Wilberforce).

[1823] An equitable lien may be regarded as a non-consensual type of security interest: in this "kind of claim the beneficiary is in effect saying 'the trustee is obliged to account personally to me for his misappropriation and those proceeds stand charged as security for his personal obligation to me'": *Serious Fraud Office v Lexi Holdings plc* [2009] QB 376, 389.

[1824] *Foskett v McKeown* [2001] 1 AC 102.

[1825] *Hanbury & Martin: Modern Equity* (22nd ed 2021) para 12-005.

[1826] See paras 19.44–19.45.

[1827] *Foskett v McKeown* [2001] 1 AC 102, and *Lewin on Trusts* (20th ed 2020) para 44-001. This includes both trustees in breach of trust and innocent third-party recipients who have, for example, been gifted assets by a defaulting trustee.

[1828] *Credit Agricole Corp and Investment Bank v Papadimitriou* [2015] UKPC 13, [2015] 1 WLR 4265.

principal. A beneficiary may follow or trace the bribe or secret commission and assert a proprietary claim over the property in question (or its substitute).[1829]

Personal remedies for breach of trust or fiduciary duty

19.60 If a trustee commits a breach which causes loss to the trust, they may be required to pay "equitable compensation" to restore the trust fund to the position that it would have been in had the breach not occurred.[1830] For example, a trustee may fail to exercise proper care when selecting investments.[1831] Alternatively, they may breach their custodial duty to safeguard the trust property by transferring trust property without proper authority.[1832]

19.61 We note that the question might arise as to whether crypto-tokens are to be treated as an asset to be preserved or rather (by analogy to money) as something to be invested. The answer to this is likely to be highly context dependent on the terms of the trust and the nature of the crypto-tokens at issue.[1833]

Dishonest assistance and knowing receipt

19.62 As noted at paragraph 19.57 above, beneficiaries have a continuing beneficial or equitable interest in trust property which they can assert against third parties currently in possession of their trust property, except those who are good faith purchasers for value without notice.[1834]

19.63 This section outlines the law on dishonest assistance and knowing receipt. Claimants can avail themselves of these equitable remedies to proceed against third parties directly implicated in a breach of trust or fiduciary duty. They are typically employed in circumstances where the third party never received any trust property or their traceable proceeds (dishonest assistance) or is no longer in possession thereof (knowing receipt).

1829 *FHR European Ventures LLP v Cedar Capital Partners LLC* [2014] UKSC 45, [2015] AC 250. The third party making the bribe may, additionally, be personally liable as a dishonest assistant (see from para 19.62 below): *Fyffes Group Ltd v Templeman* [2000] 2 Lloyd's 643; *Novoship (UK) Ltd v Mikhaylyuk* [2014] EWCA Civ 908, [2015] QB 499.

1830 *AIB Group (UK) Plc v Mark Redler & Co Solicitors* ("AIB") [2014] UKSC 58, [2015] AC 1503. See *Snell's Equity* (34th ed 2019) para 30-011.

1831 *Byrnes v Kendle* [2011] HCA 26 (High Court of Australia) at [119]: "it is the duty of a trustee to obtain income from the trust property if it is capable of yielding an income. If the property is money, it should be invested at interest or used to purchase income-yielding assets like shares."

1832 Uncertainty remains as to whether loss is always to be assessed counter-factually (by reference to the diminution in value caused to the trust estate by the breach of duty) or whether, in some cases, the quantum of liability is to be assessed by reference to the financial value of the subject matter wrongfully transferred by the trustee. See: *Auden McKenzie (Pharma Division) Limited v Patel* [2019] EWCA Civ 2291; *Interactive Technology Corporation Ltd v Ferster* [2018] EWCA Civ 1594. See further: A Georgiou, "Taking trusts seriously" (2021) 137 *Law Quarterly Review* 305.

1833 Part II of the Trustee Act 2000; Capital and Income in Trusts: Classification and Apportionment (2009) Law Com 315 para 2.69.

1834 This defence operates such that an equitable title to an object of personal property is extinguished as against the purchaser of the legal title to the object if they are a good faith purchaser for value without notice of the equitable interest. The good faith purchaser of the legal interest takes free of the equitable interest. See *Snell's Equity* (34th ed 2019) paras 4.017 to 4.041.

19.64 Dishonest assistance is an accessorial form of liability, applicable to a defendant who dishonestly (in the criminal law sense)[1835] assists or induces a trustee or fiduciary to commit a breach of trust or other fiduciary duty.[1836] Dishonest assistants will be jointly and severally liable for any losses suffered by the claimant as a result of the breach of trust (in the form of equitable compensation).[1837] Further, they may also be required to disgorge any profits which are sufficiently causally connected to the wrongdoing, provided that this would not be disproportionate to the wrongdoing.[1838]

19.65 Knowing receipt is where a third-party defendant received property disposed of in breach of fiduciary duty[1839] or breach of trust.[1840] To succeed, the claimant must show that their property was disposed of in breach of fiduciary duty or breach of trust. They must also show that this property (or its traceable proceeds) was received by the defendant for their own benefit, in the knowledge that trust property had been transferred in breach of fiduciary duty or breach of trust.[1841] The liability of the defendant is a personal one to restore the value of the property received rather than to restore the property itself.[1842] This is typically most useful in a situation where a claimant is seeking a personal monetary remedy against a solvent third-party defendant who has disposed of the trust property which they received.[1843]

Application of equitable wrongs to data objects

19.66 In our provisional view, the principles governing the award of equitable remedies are sufficiently flexible to be applied to situations involving data objects such as crypto-tokens. As with contractual remedies, the nature of the crypto-token and the facts of the case will be relevant to the availability of a particular remedy, but data objects do not (we think) necessitate any amendment to existing principles.[1844]

19.67 For example, in circumstances where a trustee mistakenly transfers a crypto-token held on trust to the wrong recipient, there are various remedies available depending on the facts. If the recipient obtained the crypto-token in good faith without value, the

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1835 See: *Ivey v Genting Casinos (UK) Ltd* [2017] UKSC 67, [2018] AC 391; *Group Seven v Notable* [2019] EWCA Civ 614 at [58]. Note that the primary breach need not be dishonest or fraudulent: *Royal Brunei Airlines Sdn Bdh v Tan* [1995] 2 AC 378.

1836 *Snell's Equity* (34th ed 2019) paras 30-077 to 30-082.

1837 *Group Seven v Notable* [2019] EWCA Civ 614, [2020] Ch 129.

1838 *Novoship (UK) Ltd v Mikhaylyuk* [2014] EWCA Civ 908, [2015] QB 499 at [107] to [120].

1839 *Arthur v Attorney-General of the Turks and Caicos Islands* [2012] UKPC 30.

1840 *Novoship (UK) Ltd v Mikhaylyuk* [2014] EWCA Civ 908, [2015] QB 499.

1841 *El Ajou v Dollar Land Holdings Plc* [1994] 1 All ER 685; *Bank of Credit and Commerce International (Overseas) Ltd v Akindele* [2001] Ch 437, 438 (CA). See further *Lewin on Trusts* (20th ed 2020) para 42-023.

1842 *Paragon Finance plc v DB Thakerar and Co* [1999] 1 All ER 400, 408 by Millett LJ.

1843 *Ultraframe (UK) Ltd v Fielding* [2005] EWHC 1368 (Ch) at [1486], and *Lewin on Trusts* (20th ed 2020) paras 42-023 to 42-027.

1844 See further M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 36-001: "the distinction between tangible and intangible is inapposite with respect to the rights of the equitable owner. … . The relevant legal rules are … largely independent of whether the equitable ownership interest is in tangible or intangible property." See Chapter 4 for a discussion of the utility of the distinction between tangible and intangible objects of property rights.

beneficiary may be able to obtain an order against the recipient for the return of the crypto-token (assuming that the recipient can be identified and is still in control of the crypto-token or its substitute).[1845] Further, the beneficiary will also be entitled to a monetary remedy against the trustee requiring them to make good any loss they have caused to the trust fund.

19.68 Similarly, an agent (a fiduciary) might be paid a bribe to induce them to enter into a crypto-token transaction on behalf of their principal. In those circumstances, we expect that a court will have no difficulty in concluding that the crypto-tokens (and/or their traceable proceeds) are held by the agent on constructive trust for the principal, in the same way as any other money or property constituting a bribe.[1846] Depending on the fluctuations in value of the crypto-tokens received, the claimant may prefer to seek an order for the transfer of the trust property itself (if the crypto-tokens have appreciated). Alternatively, they may choose to bring a personal claim against the agent, partially secured by an equitable lien against the property held on constructive trust, for the value of the crypto-token at the time of receipt (if the crypto-tokens have depreciated).

19.69 In conclusion, therefore, our view is that the existing principles applicable to equitable remedies can be applied to disputes involving data objects in the same way as they are to other objects of property rights. We consider that practical questions, such as the relevance of an on-chain transaction record to whether a third party has notice of a beneficial interest, are capable of being resolved by the courts in the ordinary course as and when they arise.

PROPRIETARY RESTITUTIONARY CLAIMS AT LAW

The general law

19.70 In *Armstrong DLW GmbH v Winnington Networks Ltd ("Armstrong")*, the claimant brought various claims to recover the value of European Union Allowances ("EUAs"), which had been transferred from the claimant to the defendant's account by a third party.[1847] The court acknowledged the existence of a proprietary restitutionary claim at law:[1848]

[1845] An innocent volunteer is someone who receives trust property innocent of any wrongdoing, but who has not given value for their receipt (such as a gift recipient as opposed to a purchaser). An innocent volunteer who passes the property on without having previously acquired knowledge of the trust incurs no personal liability: *Independent Trustee Services Ltd v GP Noble Trustees Ltd* [2012] EWCA Civ 195, [2013] Ch 91. If, however, the third party had notice of the fact that the crypto-tokens were transferred to its public address in breach of trust prior to disposing of the assets, they would be personally liable for knowing receipt (and/or a proprietary claim for their traceable proceeds).

[1846] See, by analogy, *FHR European Ventures LLP v Cedar Capital Partners LLC* [2014] UKSC 45, [2015] AC 250.

[1847] *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10 (Ch), [2013] Ch 156.

[1848] Above at [84] to [85] by Stephen Morris QC. It is worth noting that the existence of a proprietary restitutionary claim at law, as distinct from a claim in unjust enrichment, has been criticised by a number of commentators, especially as regards claims to property which is substituted for the original property received. See Birks, *Unjust Enrichment* (2nd ed) pp 34 to 36; A Burrows, "Proprietary Restitution: Unmasking Unjust Enrichment" (2001) 117 *Law Quarterly Review* 412.

> In my judgment, on the current state of the authorities and in particular [*Foskett v McKeown* [2001] 1 AC 102, *Trustee of the Property of FC Jones v Jones* [1997] Ch 159 and *Lipkin Gorman (a firm) v Karpnale* [1991] 2 AC 548] there is a basis of claim which can conveniently be labelled a proprietary restitutionary claim which is distinct from a claim for restitution on grounds of unjust enrichment. … The essence of such a claim at common law is that the claimant is seeking to enforce his subsisting legal property rights in an asset held by the defendant. The asset in respect of which the claimant is asserting a claim may be identified by following the claimant's original asset into the defendant's hands or by tracing it into a substitute asset in the defendant's hands.

19.71 The court went on to extend the scope of a proprietary restitutionary claim at law to intangible property in the form of EUAs, after first outlining when such an action would traditionally arise:[1849]

> This type of claim does not arise where the relevant asset is a chattel or land or even a documentary intangible, because there are other distinct causes of action in tort covering these types of property. It does arise where the asset in the hands of the defendant is money (possibly, under the old common law action for money had and received). … In my judgment, as a matter of authority and principle, if and where legal title remains with the claimant, a proprietary restitutionary claim at common law is available in respect of receipt by the defendant of a [thing] in action or other intangible property.

19.72 It is important to note that, as a general rule, the common law has no proprietary remedies.[1850] Consequently, if the claimant has retained legal title to the object of property rights which has been received by the defendant, the claimant can only claim the value of the property rather than the property itself.[1851]

Application of proprietary restitutionary claims at law to data objects

19.73 It seems arguable that, following the decision in *Armstrong*, a proprietary restitutionary claim would, in principle, be available where the claimant retains legal title to a particular data object.[1852] Indeed, such a claim would (helpfully) not be subject to the

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[1849] *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10 (Ch), [2013] Ch 156 at [86] and [94] by Stephen Morris QC. On the facts, however, such a claim failed because the court held that that there had been a separation of legal and beneficial title to the European Union Allowances. This aspect of the decision has been criticised: see for example C Buckingham, "Intangible Property and Proprietary Restitution in the High Court" [2013] *Lloyd's Maritime and Commercial Law Quarterly* 296, 302. However, it was held that if there was no relevant separation of legal and beneficial title to the property, legal title would have remained vested in the claimant, who would have had a proprietary restitutionary claim at common law for the value of the property.

[1850] *OBG Ltd v Allan* [2007] UKHL 21, [2008] AC 1 at [308] by Baroness Hale.

[1851] *Trustee of the Property of FC Jones and Sons (a firm) v Jones* [1997] Ch 159, 168 by Millett LJ. The only true exception to this relates to land, where the claimant is able to recover land from the defendant. There is also the remedy of delivery up of goods under section 3(3) of the Torts (Interference with Goods) Act 1977, which is a proprietary remedy which is available where the defendant has committed a tort involving interference with the claimant's property rights, such as conversion. But this remedy is discretionary and is only available where compensatory damages are an inadequate remedy.

[1852] In addition, following *Foskett v McKeown* [2001] 1 AC 102, such a claim could be brought at equity where the claimant has an equitable interest in the property in the hands of the defendant.

limitation applicable to conversion (that is, that the property in question must be tangible property capable of possession).[1853] Whether the claimant retains such title depends on the applicable rules of derivative transfer of title.[1854] Before being able to assert such a claim the claimant would need either to follow or trace the data object into the hands of the defendant. Even though *Armstrong* was concerned with following rather than tracing, the Judge framed the proprietary restitutionary claim as applicable regardless of whether tracing or following was applicable.[1855]

19.74 Given the current inapplicability of conversion claims to intangible property,[1856] this cause of action is likely to be applicable in cases where A's data object is fraudulently misappropriated or "stolen" by B and transferred to the defendant C in circumstances where A retains legal title to the property.[1857]

19.75 For example, suppose Alice holds a data object in the form of a non-fungible token ("NFT"), and Bob perpetrates a wrench-attack on Alice and uses her account to transfer the NFT to Caroline.[1858] First, Alice would need to prove that her legal title in the crypto-token did not pass to Caroline. We argued in Chapter 13 that even though the crypto-token system record might constitute a presumption of title to the crypto-token in question, such a presumption is rebuttable if sufficient evidence can be provided to show that the transaction was defective. In this case, therefore, Alice would need to prove that despite the transfer of the NFT to Caroline (recorded on the crypto-token system), and the subsequent acquisition of control by Caroline, Alice retained legal title to the NFT on the basis that it was "stolen" from her by Bob.[1859]

1853 D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.102.

1854 We discuss how the law on derivative transfer of title is applicable to crypto-tokens in Chapter 13.

1855 *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10 (Ch), [2013] Ch 156 at [85] by Stephen Morris QC. The judge said that: "The asset in respect of which the claimant is asserting a claim may be identified by following the claimant's original asset into the defendant's hands or by tracing it into a substitute asset in the defendant's hands".

1856 We discuss the possible extension of conversion to data objects in more detail from para 19.103 below.

1857 Whether A can recover the data object (or its traceable proceeds) from C depends on whether A can establish an equitable proprietary interest in the property that is not defeated by a good faith purchaser defence. The court in *Armstrong* held that the fraudsters in question were constructive trustees of the intangible property. This property was said to be held on constructive trust for the claimant on the basis that the fraudster's ministerial control over the European Union Allowances after the theft gave it "some form of de facto legal title", and that there was therefore a separation of the legal and beneficial interest in the property. However, this type of trust (in the context of theft) has created conceptual difficulties. See, for a discussion on this issue, *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) para 8-67 onwards, and L Chambers and C Buckingham, "Intangible Property and Proprietary Restitution in the High Court" [2013] *Lloyd's Maritime and Commercial Law Quarterly* 296, 302. We discuss this in more detail from para 19.82 below.

1858 We note that factual circumstances similar to this hypothetical situation have already arisen. For example, actor Seth Green recently suggested that he was the victim of a phishing attack in relation to certain NFTs: https://twitter.com/SethGreen/status/1526588358859759617?ref_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E1526588358859759617%7Ctwgr%5E%7Ctwcon%5Es1_&ref_url=https%3A%2F%2Fbitcoinist.com%2Fseth-green-animated-show-stolen-bored-ape%2F.

1859 The general position is that a thief does not acquire legal title to the property that they steal and cannot therefore transfer that title, even to a good faith purchaser (although note the exception in the case of money

19.76 Assuming Alice could establish legal title to the NFT, she will then need to follow or trace the NFT (or its substitute) to Caroline. In this regard, as we argued above, the appropriate analysis is likely to be one of tracing.[1860] To the extent that Alice is able to trace her NFT to Caroline (which may be more or less complex depending on the crypto-token system and the limitations of tracing at common law),[1861] she will be able to assert a proprietary restitutionary claim against Caroline for the value of the NFT.[1862] In this regard, the value of the NFT may take into account any linked items external to the system, depending on the precise nature of the link between the NFT and the external thing.[1863]

UNJUST ENRICHMENT

The general law

19.77 Claims based on unjust enrichment do not depend on the existence of any contract. Rather, under the law of England and Wales, unjust enrichment is a distinct source of rights and obligations.[1864] A claim in unjust enrichment is "not a claim for compensation for loss, but for recovery of a benefit unjustly gained [by a defendant] at the expense of the claimant".[1865] A claimant must therefore show three things to establish a claim in unjust enrichment.[1866]

(1) First, that the defendant was enriched. An enrichment may be either positive (the receipt of money or goods) or negative (the saving of a necessary

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that has passed into currency, and negotiable instruments): *Miller v Race* (1758) 97 ER 398, also discussed in Chapter 13. See *Shalson v Russo* [2003] EWHC 1637 (Ch), [2005] Ch 281, 317 and generally W Swadling, "Ignorance and Unjust Enrichment: The Problem of Title" (2008) 28 *Oxford Journal of Legal Studies* 627, 657, where it is stated that: "In respect of a pocket which has been picked, title remains with the victim". This is also not to be confused with the fact that the thief is said to obtain a possessory title to the stolen property which is distinct from the residual (superior) legal title retained by the victim: *Costello v Chief Constable of Derbyshire Council* [2001] EWCA Civ 381, [2001] 1 WLR 1437 at [31] by Lightman J; *Islamic Republic of Iran v Barakat Galleries Ltd* [2007] EWCA Civ 1374, [2009] QB 22 at [15] by Lord Phillips.

1860 See the discussion from para 19.43.

1861 Even if the transactional history of a crypto-token is traceable, evidence extrinsic to the crypto-token system is likely to be needed to identify the people in the real world who control the public keys recorded on it. See D Fox, "Cryptocurrencies in the Common Law of Property" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 6.78.

1862 However, following *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10 (Ch), [2013] Ch 156, Caroline would be able to raise the special defence of good faith purchaser for value without notice to defeat Alice's proprietary restitutionary claim at law. This defence (which originally only applied at equity with money being the key exception) arguably limits the utility of this claim: see C Buckingham "Intangible Property and Proprietary Restitution in the High Court" [2013] *Lloyd's Maritime and Commercial Law Quarterly* 296, 303. But it is consistent with our suggested proposal for the introduction of a special defence of good faith purchaser for value without notice in the context of crypto-tokens. For more detail, see Chapter 13 from para 13.54.

1863 We discuss linking in more detail in Chapter 14.

1864 *Chitty on Contracts* (34th ed 2021) para 3-088.

1865 *Boake Allen Ltd v HMRC* [2006] EWCA Civ 25, [2006] STC 606 at [175].

1866 *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) para 1-09.

expenditure).[1867] The claimant must show that the defendant received a recoverable benefit (such as property, money, services, or discharged obligations) with an objective financial value.[1868] Given that money is a universal medium of exchange, there is no difficulty in establishing the element of enrichment where the defendant has received money from the claimant.[1869] In the case of property or services, their objective value is likely represented by the market price.[1870] In *Benedetti v Sawiris and others,* Lord Clarke said that, in some cases, it may be permissible to reduce the objective market value of the enrichment to the defendant so that the claimant receives less than the objective market value of the property.[1871]

(2) Second, that the enrichment was "at the expense of the claimant". This entails demonstrating a sufficiently close link between the claimant's loss and the defendant's gain. Generally, the enrichment will come directly from the claimant and the defendant's gain will correspond exactly with the claimant's loss.[1872] However, a claim in unjust enrichment may lie in some indirect cases[1873] — including where the claimant discharges a defendant's liability to a third party by paying money to the third party,[1874] or where an intervening transaction is a sham effected to conceal the connection between the claimant and the defendant.[1875]

(3) Third, that it is unjust for the defendant to retain the benefit without making restitution to the claimant.[1876] The main grounds for restitution (or unjust factors)

1867 *Halsbury's Laws of England* (2019) Vol 88 Restitution and Unjust Enrichment para 411; *Phillips v Homfray* (1883) 24 ChD 439, 454 to 455 by Bowen LJ.

1868 *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) para 4–03 and 4-26.

1869 *Halsbury's Laws of England* (2019) Vol 88 Restitution and Unjust Enrichment para 412.

1870 *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) para 4-12.

1871 A defendant will not be able to rely on this principle of autonomy or freedom of choice where the defendant has chosen the benefit, freely accepted the benefit, or is incontrovertibly benefitted by it. "An incontrovertible benefit is 'an unquestionable benefit, a benefit which is demonstrably apparent and not subject to debate and conjecture'": *Benedetti v Sawiris* [2013] UKSC 50, [2013] 4 All ER 253 at [25] by Lord Clarke, and at [189] by Lord Neuberger.

1872 *Halsbury's Laws of England* (2019) Vol 88 Restitution and Unjust Enrichment para 418.

1873 See the recent decision of *Tecnimont Arabia Limited v National Westminster Bank Plc* [2022] EWHC 1172 (Comm) at [113] by Bird J for a discussion of the various ways a claimant can establish the "at the expense of" requirement.

1874 *Burston Finance v Speirway* [1974] 1 WLR 1648; *Colonial Bank v Exchange Bank of Yarmouth, Nova Scotia* (1885) 11 App Cas 84 (where a third party acts as the claimant's agent); *Woodward v Ashton* (1676) 2 Mod Rep 95 (where the defendant obtains a benefit from a third party by usurping the claimant's office).

1875 *HMRC v Investment Trust Companies* [2017] UKSC 29, [2018] AC 275 at [48], referring to *Relfo v Varsani* [2014] EWCA Civ 360, [2015] 1 BCLC 14.

1876 A Burrows, *English Private Law* (2nd ed 2007) para 18.40.

include a mistake of fact or law,[1877] undue influence,[1878] duress,[1879] and failure of basis (also known as total failure of consideration).[1880]

19.78 A defendant to an unjust enrichment claim may be able to raise a defence, such as change of position.[1881]

Remedies for unjust enrichment

19.79 The remedy for unjust enrichment is restitution. The purpose of a restitutionary remedy is to reverse the defendant's enrichment. It usually takes the form of a monetary award, representing the value of the defendant's enrichment.[1882] Enrichment is generally determined at the date of receipt of the benefit.[1883] The availability of proprietary remedies for unjust enrichment has not been authoritatively determined in this jurisdiction.[1884]

Application of unjust enrichment to data objects

19.80 We think that a claim in unjust enrichment would be available in the context of data objects in much the same way as for any other object of property rights. The questions that arise for consideration are the same regardless of the object of property rights in question: whether one party has been enriched at the expense of the other by receipt of the property, in circumstances which are unjust. While the precise nature of the data object in question will undoubtedly give rise to novel factual scenarios for courts to consider, we see no reason why existing principles of unjust enrichment could not be applied in the ordinary course.

19.81 Indeed, English and Welsh courts have already recognised the potential availability of a claim in unjust enrichment in the context of intangible property. In *Fetch.ai Ltd and another v Persons Unknown Others ("Fetch")*,[1885] the court accepted that (in the context of service out of the jurisdiction) the claimant had "reasonably arguable claims" in respect of unjust enrichment. In that case, fraudsters had obtained access

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1877 *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) para 9-06.

1878 *Halsbury's Laws of England* (2019) Vol 88 Restitution and Unjust Enrichment para 452.

1879 *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) para 10-01.

1880 Above; *Barnes v The Eastenders Group* [2014] UKSC 26, [2015] AC 1; *Rotam Agrochemical Co Ltd v GAT Microencapsulation GmbH* [2018] EWHC 2765 (Comm). Note that the category of unjust factors is not a closed list — although the court is unlikely to recognise new grounds without compelling reasons: *Woolwich Equitable Building Society v IRC* [1993] AC 70.

1881 Change of position entails that a defendant is able to escape liability in unjust enrichment where their "position has so changed that it would be inequitable in all the circumstances to require [the defendant] to make restitution, or alternatively restitution in full": *Lipkin Gorman v Karpnale Ltd* [1991] 2 AC 548, 580 by Lord Goff.

1882 *Bank of Cyprus UK Limited v Menelaou* [2015] UKSC 66, [2016] AC 176 at [81] by Lord Neuberger.

1883 *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) para 4-54.

1884 Above paras 40-18 to 40-30.

1885 [2021] EWHC 2254 (Comm).

to the claimant's accounts held with a crypto-token exchange and moved crypto-tokens out of the claimant's accounts to third-party accounts.[1886]

19.82 Similarly, the decision in *Armstrong* indicates that a claim in unjust enrichment could, in theory, be available in the context of certain types of intangible property. In this case, the court left open the possibility of a claim in unjust enrichment to recover intangible property such as the EUAs, although on the facts the court characterised the claim as one of knowing receipt or proprietary restitution.[1887] Following the reasoning in *Fetch* and *Armstrong*, we think that a claim in unjust enrichment could be available for data objects (as an object of property rights), provided the various elements to substantiate the claim have been met.[1888]

19.83 For example, suppose A mistakenly transfers 20, rather than the contractually agreed 10, bitcoin to B, the defendant.[1889] Upon A notifying B, B refuses to transfer the additional 10 bitcoin (or their value) back to A.[1890] Where a party has transferred bitcoin to another party by mistake, the requirements for a claim in unjust enrichment are likely to be satisfied. First, in this example, the bitcoin transferred is likely to constitute an enrichment, as it has an objective financial value equal to the market value of the bitcoin. However, given that bitcoin is not currently considered money (or analogous thereto), B might be able to subjectively devalue the bitcoin such that the value of the enrichment is less than the market value.[1891] This means that A may recover less than the objective market value of the bitcoin in the enrichment action. It is important to note, however, that B will not be able to rely on this principle where B has chosen or freely accepted the bitcoin.[1892]

1886 *Fetch.ai Ltd and another v Persons Unknown Others* [2021] EWHC 2254 (Comm) at [8] by Judge Pelling.

1887 *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10 (Ch), [2013] Ch 156 at [96] by Stephen Morris QC.

1888 In Chapter 9 we discuss whether carbon emission allowances would satisfy our proposed criteria of data objects.

1889 If A's bitcoin, rather than being held directly, is held with a crypto-token exchange, this will require a consideration of the legal relationships involved. In such a case, it seems probable that the relationship will be akin to that between a bank and its ultimate customer. This contractual set-up will have implications for the bases on which any restitutionary claim is brought, including who (the user or the exchange) might bring a claim in unjust enrichment. We discuss custody relationships in more detail in Chapter 16. See also Watterson, "Contextual and Conceptual Foundations of Private Law Claims involving Cryptocurrencies" in C Mitchell and S Watterson, *The World of Maritime and Commercial Law: Essays in Honour of Francis Rose* (2020) p 335.

1890 On the current law, no claim in conversion would lie against B.

1891 See S Watterson, "Contextual and Conceptual Foundations of Private Law Claims involving Cryptocurrencies" in C Mitchell and S Watterson, *The World of Maritime and Commercial Law: Essays in Honour of Francis Rose* (2020) p 339. This is one of the examples where the characterisation of certain crypto-tokens as money (or analogous thereto) has implications for the law of unjust enrichment. When establishing a defendant's enrichment, if the benefit received is money, it is often said that the benefit is "incontrovertible" meaning that the defendant cannot subjectively devalue the benefit. However, non-monetary benefits generally can be subjectively devalued. This means that such benefits are typically more difficult to value, and the claimant may obtain less than the property's market value in an unjust enrichment claim.

1892 *Benedetti v Sawiris* [2013] UKSC 50, [2013] 4 All ER 253 at [25] by Lord Clarke, and at [189] by Lord Neuberger; *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) para 4-45, where it is noted (at n 83)

19.84 Third, assuming that A can establish an enrichment (even if less than the objective market value) A's loss of the bitcoin corresponds with B's gain such that the enrichment is at A's expense. Finally, it would be unjust for B to retain the value of the bitcoin since it was mistakenly transferred. A would therefore (subject to any possible defences B might have) be able to obtain a personal restitutionary remedy against B for the value of the bitcoin.[1893] Importantly, the fact that the transfer may have been accepted and validated by the crypto-token system in accordance with the relevant protocol rules is not determinative of whether the transfer is valid in accordance with existing legal principles. Indeed, there is no compelling reason why a legal system should disregard flaws in a transaction which normally justify restitutionary relief.[1894]

19.85 It is worth mentioning that the extent to which A can bring a claim in unjust enrichment in the above scenario may depend, in part, on whether A has lost legal title to the relevant crypto-tokens.[1895] If A has lost legal title to the object of property rights, then unjust enrichment would appear to be an appropriate cause of action, as B's new title (at the expense of A's lost title) would arguably constitute B's enrichment. If, however, it is determined that A retained legal title to the crypto-tokens,[1896] there is precedent to the effect that A's cause of action is instead a proprietary restitutionary claim at law to vindicate A's pre-existing title, which is a claim founded on the vindication of property rights and not unjust enrichment.[1897] In such a case, since the proprietary restitutionary claim is at law, A would only be able to obtain a personal *remedy* (even

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that "free acceptance" occurs where a recipient knows that a benefit is being offered to him non-gratuitously and where they, having the opportunity to reject, choose to accept the benefit.

1893 There is case law to the effect that (in the context of over-payments of money by mistake where the defendant is notified accordingly) the money is held on constructive trust for the claimant. See *Westdeutsche Landesbank Girozentrale v Islington LBC* [1996] AC 669, 715 by Lord Browne-Wilkinson.

1894 See also S Watterson, "Contextual and Conceptual Foundations of Private Law Claims involving Cryptocurrencies" in C Mitchell and S Watterson, *The World of Maritime and Commercial Law: Essays in Honour of Francis Rose* (2021) p 332, where the point is made that this might be different where there is a system rule, agreed to by users of the system, that the transaction record should be conclusive of lawful entitlements.

1895 *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10 (Ch), [2013] Ch 156.

1896 We discuss the law on derivative transfer of title and its applicability to crypto-tokens in Chapter 13. See also the discussion in G Virgo, *The Principles of the Law of Restitution* (3rd ed 2015) p 576 as to whether mistake as to the quantity of property transferred constitutes a fundamental mistake such that title to the property does not pass to the defendant.

1897 *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10 (Ch), [2013] Ch 156, although this case concerned a situation where the claimant's property was stolen by a third party and subsequently sold to the defendant, rather than being a direct transfer. This aspect of the decision has been the subject of extensive debate. See W Swadling, "Ignorance and Unjust Enrichment: A Problem of Title" (2008) 28 *Oxford Journal of Legal Studies* 627, where the author argues that where the claimant retains (legal) title in property transferred, the claimant has no personal claim in unjust enrichment. This view is supported by RB Grantham and CEF Rickett, "Restitution, Property and Mistaken Payments" [1997] *Restitution Law Review* 83, 87, and was endorsed by the court in *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10 (Ch), [2013] Ch 156. For a contrary view, see A Burrows, *The Law of Restitution* (3rd ed 2011) p 408, where the point is made that the law of unjust enrichment is concerned with the transfer of value from the claimant to the defendant, and it is therefore not essential that there has been the transfer of a right let alone the transfer of title. For a similar view, see *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) paras 8-22 to 8-25, and G Virgo, *Principles of the Law of Restitution* (3rd ed 2016) p 155. For a general discussion of the application of unjust enrichment principles to cases that would previously have been dealt with as asset misappropriations under the action for money had and received, see T Cutts, "Modern Money Had and Received" (2018) 38 *Oxford Journal of Legal Studies* 1.

though the claim is a proprietary restitutionary claim) for the value of the crypto-tokens. A would not be able to obtain a proprietary remedy attaching or related to specific objects of property (which is only available at equity).[1898]

19.86 In sum, we consider that the existing principles of unjust enrichment can be applied to disputes involving data objects in the same way as they are to other objects of property rights. The fact that data objects, such as crypto-tokens, are recognised as a distinct category of property rights does not appear to require a reform or development of the principles of the law of unjust enrichment. Nonetheless, the application of existing principles to data objects may give rise to novel considerations. For example, determining the nature and value of an enrichment where a crypto-token is involved (particularly a crypto-token that is linked to something external to the system).[1899] Or establishing that an enrichment is at the claimant's expense where the crypto-token is hosted on a distributed ledger system or through an intermediated holding. These are new factual questions a court may need to grapple with in the context of data objects. The outcome of any unjust enrichment enquiry will, as it currently does, depend on the facts of the particular case, and the object of property rights in question.

PROVISIONAL CONCLUSION

19.87 As set out above, we consider that much of the current law concerning causes of action and remedies can be applied to data objects such as crypto-tokens in the same way as they are to other types of (non-monetary) objects of property rights. We provisionally conclude that there is no need for bespoke rules or reform. Instead, what is required is that the courts recognise the nuances and idiosyncrasies of data objects, and apply existing legal principles to such objects as far as possible.

[1898] We discuss proprietary restitutionary claims at law in more detail from para 19.70 above.

[1899] We discuss linking in more detail in Chapter 14. The analysis of an enrichment might also depend on whether the crypto-token in question is specific or fungible, as this will be relevant for determining the market value of such property.

Consultation Question 42.

19.88 We provisionally conclude that the following existing legal frameworks can be applied to data objects, without the need for statutory law reform (although the common law may need to develop on an iterative basis):

(1) breach of contract;

(2) vitiating factors;

(3) following and tracing;

(4) equitable wrongs;

(5) proprietary restitutionary claims at law; and

(6) unjust enrichment.

Do you agree?

THE TORT OF CONVERSION

The general law

19.89 When a person's tangible property is interfered with by another, they can sue in the tort of conversion.[1900] This is the law of England and Wales' primary means of protecting interests in tangible personal property.[1901]

19.90 Professor Sarah Green[1902] and John Randall QC expressed the three elements of conversion as follows: (1) a claimant who has the superior possessory right; (2) a deprivation of the claimant's full benefit of that right; and (3) an assumption by the defendant of that right.[1903] To bring a claim in conversion, therefore, it is not necessary for the claimant to prove "ownership" of the tangible object in question. Indeed, even

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[1900] The principal ways in which conversion may take place are when a tangible object of property rights is: (1) wrongfully taken or received by someone not entitled to do so; (2) wrongfully parted with; (3) lost by a bailee in breach of their duty to the bailor; (4) wrongfully sold, even without delivery, so as to pass good title to the buyer; (5) wrongfully retained; (6) wrongfully misused or destroyed; and (7) wrongfully denied access to by the defendant, without physical interference: *Clerk & Lindsell on Torts* (23rd ed 2021) para 16-08.

[1901] Torts (Interference with Goods) Act 1977, s 14(1) defines the phrase "goods" as including "chattels personal other than things in action and money".

[1902] Professor Sarah Green is the Commissioner for Commercial and Common Law at the Law Commission of England and Wales, and lead Commissioner for this project.

[1903] S Green and J Randall, *The Tort of Conversion* (2009) p 75; *Kuwait Airways Corp v Iraqi Airways Co (Nos 4 & 5)* [2002] UKHL 19, [2002] 2 AC 883 at [39] by Lord Nicholls: "In general, the basic features of the tort are threefold. First, the defendant's conduct was inconsistent with the rights of the owner (or other person entitled to possession). Second, the conduct was deliberate, not accidental. Third, the conduct was so extensive an encroachment on the rights of the owner as to exclude him from use and possession of the goods".

an owner may not sue in conversion unless they have either possession of the asset or the right to immediate possession.[1904]

19.91 Conversion is a strict liability tort. This means that the defendant is potentially liable regardless of how reasonable or well-intentioned their action,[1905] and whether the defendant knew that they were wrongly interfering with the claimant's property.[1906] The limited defences to this tort include that the claimant is not entitled to immediate possession due to illegality,[1907] and that third parties have rights to the property which are superior to those of the claimant.[1908]

Remedies for conversion

19.92 Section 3(2) of the Torts (Interference with Goods) Act 1977 ("the 1977 Act") provides that relief for conversion may be awarded in any one of the following forms:

> (a) an order for delivery of the goods, and for payment of any consequential damages;
>
> (b) an order for delivery of the goods, but giving the defendant the alternative of paying damages by reference to the value of the goods, together in either case with payment of any consequential damages; or
>
> (c) damages.

19.93 The court has a discretion whether to order the relief under section 3(2)(a), whereas the claimant may choose between the latter two.[1909] Generally, an order for delivery of the goods is not made in respect of ordinary articles of commerce.[1910] Instead, an order under section 3(2)(a) is normally considered appropriate for items that are

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1904 *Clerk & Lindsell on Torts* (23rd ed 2021) para 16-43.

1905 See *Tongue v RSPCA* [2017] EWHC 2508 (Ch) where the defendant was liable in conversion for moving cattle from an absent farmer's land without permission, although this was done to enable the cattle to be better cared for. See also *Marfani & Co Ltd v Midland Bank Ltd* [1968] 1 WLR 956, 970 to 971 by Diplock LJ.

1906 *Marfani & Co Ltd v Midland Bank Ltd* [1968] 1 WLR 956, 970 to 971 by Diplock LJ, who noted that this principle was "subject to some exceptions".

1907 *Clerk & Lindsell on Torts* (23rd ed 2021) para 16-84. Where the possession of the goods concerned is itself illegal or where it is illegal for the defendant to give the claimant possession, the defendant may argue that the owner is not entitled to immediate possession.

1908 *Malone v Metropolitan Police Commissioner* [1980] QB 49; *Clerk & Lindsell on Torts* (23rd ed 2021) para 16-88. A defendant may plead that a named third party has a better right than the claimant, and to have all known competing claims determined simultaneously.

1909 Torts (Interference with Goods) Act 1977, s 3(3)(b).

1910 See *X-Fab Semiconductor Foundries AG v Plessey Semiconductors Ltd* [2014] EWHC 1574 (QB) at [32], following dicta of Beatson J in *Blue Sky One Ltd v PKF Finance US Inc* [2009] EWHC 3314 at [309].

unique or have sentimental value,[1911] for items that are of particular value to the claimant,[1912] or items that would be difficult to replace.[1913]

19.94 The measure of damages in conversion is the claimant's loss, which in practice is typically the market value of the goods.[1914] Generally, the value of the goods is assessed as at the time of the conversion.[1915] The court also has the power to make an interim order for delivery up of goods detained which are or may become the subject matter of subsequent proceedings for wrongful interference.[1916]

Subject matter of conversion

19.95 In the law of England and Wales, the settled position is that conversion lies in respect of dealings with tangible objects of personal property rights.[1917] It has been held that incorporeal property,[1918] copyright,[1919] information,[1920] and documents stored electronically on a computer hard drive,[1921] cannot be the subject matter of this tort.

19.96 In the landmark case of *OBG v Allan* in 2007,[1922] the House of Lords ruled that since contractual rights are a type of intangible property, and intangible property cannot be possessed, an action in conversion could not lie in respect of such property.[1923] The majority of the court held that expanding conversion to cover things in action would be too radical a change for the court to make. The reasoning on *OBG v Allan* was

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1911 *García v De Aldama* [2002] EWHC 2087, [2003] ECDR CN1 (manuscript of poet Federico García Lorca: specific delivery would have been granted had claimant proved his case).

1912 *Secretary of State for Defence v Guardian Newspapers Ltd* [1984] Ch 156, [1984] 2 WLR 268.

1913 *Steel Linings Ltd v Bibby & Co* [1993] RA 27 (tools of trade); *X-Fab Semiconductor Foundries AG v Plessey Semiconductors Ltd* [2014] EWHC 1574 (QB) (highly specialised electronic equipment).

1914 *Kuwait Airways v Iraqi Airways Co* [2002] UKHL 19, [2002] 2 AC 883 at [67] by Lord Nicholls.

1915 *Mercer v Jones* (1813) 3 Camp 477. Although the court is not strictly bound by this rule if assessment of damages with reference to a later date more truly represents the claimant's loss: see *Clerk & Lindsell on Torts* (23rd ed 2021) para 16-97.

1916 Torts (Interference with Goods) Act 1977, s 4.

1917 The Torts (Interference with Goods) Act 1977, having introduced the concept of "wrongful interference with goods", defines goods in s 14 as including "all chattels personal other than things in action and money". This is similar to the definition used in the Sale of Goods Act 1979, s 61(1).

1918 *OBG Ltd v Allan* [2007] UKHL 21, [2008] 1 AC 1, which held that as a matter of law there could be no conversion of incorporeal property, and hence the defendants who had appropriated to themselves the benefits of certain contractual rights vested in the claimants could not be sued for conversion.

1919 *Stewart v Engel* [2000] BCC 741.

1920 *Murphy v Electoral Commission* [2019] EWHC 2762 (QB), [2020] 1 WLR 480.

1921 *Thunder Air Ltd v Hilmarsson* [2008] EWHC 355 (Ch). See also *Your Response Ltd v Datateam Business Media Ltd* [2014] EWCA Civ 281, [2015] QB 41, where the point was made that that intangible material in a database was not subject to conversion, and there was no possibility of having a lien over it.

1922 [2007] UKHL 21, [2008] 1 AC 1.

1923 Although note that the minority judgments of Lords Walker and Brown appear to suggest that conversion should be extended to things in action, including bare legal rights.

considered in *Your Response Ltd v Datateam Business Media Ltd*,[1924] where Lord Justice Moore-Bick noted (with regard to intangible property) that:[1925]

> The decision in *OBG v Allan* prevents us from holding that property of that kind is susceptible of possession so that wrongful interference can constitute the tort of conversion.

19.97 However, possession[1926] is relevant to conversion in terms of what the claimant has lost rather than what the defendant has gained. In *Douglas Valley Finance Co Ltd v S Hughes (Hirers) Ltd*,[1927] for example, the defendants were found liable in conversion despite not having physical possession of the relevant objects of personal property rights (albeit that the objects were tangible).[1928] What was significant about possession in that case was the claimant's inability to use and control the objects in question.

19.98 Indeed, Professor Sarah Green[1929] and John Randall QC have argued that the tangibility of a thing should not be determinative of whether it can be possessed and therefore converted. Instead, they propose that where the asset in question is one in which property interests can vest, and which has characteristics that allow it to be treated analogously to tangible objects, it should be capable of being the subject matter of conversion.[1930] In the context of digital assets (which we extrapolate to crypto-tokens for the purposes of our analysis) they note that:[1931]

> The identification of something as tangible or not should not be dispositive of the question of whether it can be possessed. The more pertinent, and more commercially relevant, inquiry is whether such things have at least one cognitive and at least one manual indicium of possession.

19.99 Despite the debate, the law of England and Wales does not presently allow intangible property to be the subject matter of the tort of conversion.

1924 [2014] EWCA Civ 281, [2015] QB 41.

1925 *Your Response Ltd v Datateam Business Media Ltd* [2014] EWCA Civ 281, [2015] QB 41 at [26], referring to *Colonial Bank v Whinney* (1885) 30 Ch D 261.

1926 *The Manchester Ship Canal Co Ltd v Vauxhall Motors Ltd* [2019] UKSC 46, [2020] AC 1161 at [42] and [55] by Lord Briggs, approving *The Manchester Ship Canal Co Ltd v Vauxhall Motors Ltd* [2018] EWCA Civ 1100, [2019] Ch 331 at [59] by Lewison LJ: "There are two elements to the concept of possession: (1) a sufficient degree of physical custody and control ("factual possession"); (2) an intention to exercise such custody and control on one's own behalf and for one's own benefit ("intention to possess") …".

1927 *Douglas Valley Finance Co Ltd v S Hughes (Hirers) Ltd* [1969] 1 QB 738.

1928 *Douglas Valley Finance Co Ltd v S Hughes (Hirers) Ltd* [1969] 1 QB 738. In this case, the claimants succeeded in their conversion claim despite the fact that the defendants were not in physical possession of the assets. McNair J accepted the claimants' submissions that conversion required the defendants to have "wrongfully asserted ownership or control of the lorries in a manner inconsistent with the ownership or right of control of the [claimants]".

1929 Professor Sarah Green is the Commissioner for Commercial and Common Law at the Law Commission of England and Wales, and lead Commissioner for this project.

1930 S Green and J Randall, *The Tort of Conversion* (2009) p 107.

1931 Above p 119.

Application of conversion to data objects

19.100 Given that intangible property cannot be the subject matter of the tort of conversion, it follows that data objects (which are regarded as intangible property) are currently incapable of being converted under the existing law of England and Wales.

19.101 Let us consider the following example to understand better the implications of the existing law. Suppose Alice owns a rare NFT which is valued highly by market participants. Her supposed friend Bob uses Alice's unlocked laptop to access the hot wallet which manages the public address associated with her rare NFT. Bob then uses Alice's laptop to authenticate a transaction operation which sends the rare NFT to a "burn address" (that is, an address from which assets cannot be recovered, rendering them permanently unspendable).[1932] Alice no longer has access to the NFT (nor does anyone else) and wishes to sue Bob in conversion for preventing her from accessing and using her object of property rights.

19.102 Alice's claim in conversion would fail; the decision in *OBG v Allan* held that intangible property (such as Alice's NFT) is not capable of being possessed and therefore cannot be converted. This means that Alice would be unable to take advantage of the remedies available under the 1977 Act. If, however, Alice were pursuing Bob for taking and destroying a unique physical painting, Alice would be able to bring a claim in conversion against Bob.

Extending conversion to data objects

19.103 We think there are good policy arguments for the extension of the tort of conversion to data objects. In the above example, given the rare and valuable nature of the NFT, Alice may very well wish to pursue an action in conversion against Bob. If conversion were available to her, Alice would be able to use section 3(2)(a) of the 1977 Act to make the case for delivery.[1933] There does not seem to be any compelling reason why, in the case of a physical object of property rights, Alice would have a cause of action and potential remedies otherwise unavailable to her in respect of the NFT. Her property interests requiring protection are the same in both cases.

19.104 For these reasons, Professor Sarah Green and John Randall QC have argued that it is arbitrary for the law to distinguish between the protection of legally identical rights on the basis of their physical form.[1934] They also make the point that "if personal property interests in certain [digital] assets are not effectively protected, those assets will not function as live and productive economic commodities".[1935] Given that comparable types of interference can arise in respect of data objects as in respect of traditional tangible property, and to ensure coherence in the law, we provisionally

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1932 For example, a public address that has no known private key.

1933 An action for delivery might have been possible if Bob had sent the NFT to his own address, instead of a burn address. If Alice cannot obtain a remedy in the tort of conversion, a question arises as to what she could do to recover the NFT or its value. It would seem that, since the NFT has been sent to a "burn address", no proprietary claim would exist. Instead, Alice might try bringing a claim in unjust enrichment against Bob on the basis that Bob obtaining access to the NFT in her account constituted an enrichment, and that Bob did not change his position in good faith by sending the NFT to the "burn address".

1934 S Green and J Randall, *The Tort of Conversion* (2009) p 146.

1935 Above p 146.

conclude that there is a good argument for extending the tort of conversion to data objects.

19.105 In light of the decision in *OBG v Allen*, we think any such development or reform would most likely need to be by way of statute, rather than by development of the common law. In that case, Lord Brown (in agreement with Lords Hoffmann and Walker) noted that the extension of conversion to intangible property would be "too radical and fundamental a change" to be developed by the common law.[1936] Further, in *Your Response v Datateam Business Media Ltd,* Lord Justice Moore-Bick similarly thought that such a change would be a "significant departure from the existing law", and that they would "await the intervention of Parliament" in this matter.[1937]

19.106 In addition, if conversion were to be extended to data objects, there would most likely need to be an amendment to the 1977 Act, which provides for conversion as an action with respect to interference with goods.[1938] Currently, the 1977 Act defines "goods" as including "all chattels personal other than things in action and money".[1939] This definition is similar to that in the Sale of Goods Act 1979 ("the 1979 Act"),[1940] and would therefore exclude data objects as they are not generally considered "goods" for the purposes of the 1979 Act.[1941] In light of this, we think the 1977 Act would need to be amended specifically to include data objects.

Consistency with other legal regimes

19.107 We argue in Chapter 4 that it is important for the law of England and Wales to remain as consistent as possible with other legal regimes with respect to data objects (particularly crypto-tokens).

19.108 In relation to the tort of conversion, we note that courts in other jurisdictions have entertained actions for conversion in respect of intangible property, and specifically, crypto-tokens.

19.109 In the United States, different states adopt a variety of approaches to the treatment of intangibles in the context of conversion. According to The Restatement (Second) of Torts, damages for conversion are available for intangible rights which are merged in a document ("the merger doctrine").[1942] Furthermore, damages may be available if the defendant prevents the exercise of intangible rights of the kind ordinarily merged in a

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1936 *OBG Ltd v Allan* [2007] UKHL 21, [2008] 1 AC 1 at [321] by Baroness Hale.

1937 *Your Response v Datateam Business Media Ltd* [2014] EWCA Civ 281, [2015] 1 QB 41 at [27].

1938 Torts (Interference with Goods) Act 1977, s 1(1).

1939 Torts (Interference with Goods) Act 1977, s 14(1).

1940 The Sale of Goods Act 1979, s 61(1).

1941 See discussion at paras 13.135–13.140.

1942 American Law Institute, Restatement (Second) of Torts (1965). This appears to be a parallel to the recognition of documentary intangibles under the law of England and Wales, although there are some differences between the two regimes. For example, under the United States' system, there is no stipulation that the relevant document must embody intangible rights to claim performance of the obligations therein; it appears to be sufficient that a document merely represents or evidences such rights. There is also no explicit requirement in the Restatement that the document itself should be tangible.

document, even if the document itself is not converted.[1943] While a few states allow only the conversion of tangible objects of property rights,[1944] many states follow the Restatement and also provide some degree of protection to intangible rights.[1945]

19.110 In addition, a number of conversion claims have been brought in the United States in relation to crypto-tokens.[1946]

19.111 In Canada, a recent first instance decision allowed a claim in conversion for a domain name.[1947]

19.112 In New Zealand, there has been a case allowing intangibles such as digital files to be converted.[1948] The concept of possession was discussed, and the judge was persuaded by academic commentary that physical control is not a necessary component of possession because possession requires excludability and exhaustibility, both of which could be displayed by digital files.[1949]

19.113 Therefore, we consider that there is international precedent for extending the tort of conversion to objects of property rights that would fall within our proposed third category of personal property. However, based on the application of our proposed criteria of data objects in this consultation paper, such an extension would not extend as far as, for example, the specific objects in question in the Canadian decision of

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1943 American Law Institute, Restatement (Second) of Torts (1965) vol 1 s 242(1), (2): "Where there is conversion of a document in which intangible rights are merged, the damages include the value of such rights. One who effectively prevents the exercise of intangible rights of the kind customarily merged in a document is subject to a liability similar to that for conversion, even though the document is not itself converted."

1944 For example, Nevada, Oklahoma and Tennessee: C W Franks, "Analysing the Urge to Merge: Conversion of intangible property and the merger doctrine in the wake of *Kremen v Cohen*" [2005] 42(2) *Houston Law Review* 489, 522.

1945 For example, Ohio, Maryland, and Missouri and New York: C W Franks, "Analysing the Urge to Merge: Conversion of intangible property and the merger doctrine in the wake of *Kremen v Cohen*" [2005] 42(2) *Houston Law Review* 489, 519.

1946 See, for example, *Kleiman v Wright* Case No. 18-CV-80176-BLOOM/Reinhart (SD Fla Dec 27, 2018) (finding that the plaintiffs had sufficiently alleged a claim for conversion with respect to bitcoin, which was transferred to various international trusts without authorisation); *Bdi Capital LLC v Bulbul Invs LLC* 446 F Supp 3d 1127 (ND Ga 2020) (finding that bitcoin may be considered as "specifically identifiable property", which could be the subject matter of conversion); *Archer v Coinbase Inc* 53 Cal App 5th 266, 267 Cal Rptr 3d 510 (Cal Ct App 2020) (finding that a claim in conversion could, in principle, lie in respect of Bitcoin Gold); *Shin v ICON Found* Case No. 20-cv-07363-WHO (ND Cal May 11, 2021) (indicating that a claim in conversion is available in California law for crypto-tokens). Note, however, the decision in *Thyroff v Nationwide Mutual Ins Co* 2007 NY Slip Op 02442 [8 NY3d 283] March 22, 2007, which indicates that under New York law, there needs to be a physical manifestation of the intangible property for it to be the subject matter of conversion.

1947 *Canivate Growing Systems Ltd v Brazier* [2020] BCSC 232.

1948 In *Henderson*, Thomas J held that the tort of conversion could extend to digital assets such as files and emails. He considered the position under the law of England and Wales following *OBG v Allan* but elected not to follow it. "Much of the reasoning in *Your Response Ltd v Datateam Business Media Ltd* is specific to the United Kingdom context. New Zealand courts are not bound by *OBG v Allan* and there is no corresponding New Zealand statute that alters the tort of conversion. Accordingly, it is certainly open to this Court to depart from the United Kingdom position": *Henderson v Walker* [2019] NZHC 2184 at [254].

1949 However, note that in Chapter 6 we provisionally conclude that digital files do not satisfy the criteria of our proposed third category of personal property.

Canivate Growing Systems Ltd v Brazier[1950] or the New Zealand decision of *Henderson v Walker*.[1951] In addition, as we discuss below, the practical effect of such an extension under the law of England and Wales would likely be limited by the application of our proposed extension of a special defence of good faith purchaser for value without notice in respect of crypto-tokens.

Potential considerations arising if the tort of conversion were to be extended to data objects

19.114 If data objects could be the subject matter of the tort of conversion, certain questions arise due to their idiosyncratic nature. We briefly discuss these below.

A "possessory" interest

19.115 First, a question arises as to how to determine whether the claimant has the requisite interest to bring a claim in conversion in relation to a data object. As discussed above,[1952] the tort of conversion requires (at common law) the claimant to have at least a possessory interest in the property concerned. While we suggest in this consultation paper that data objects are not capable of "physical" possession, we think it should nonetheless be possible to establish a suitable analogous interest in them for the purposes of conversion by reference to the concept of control.[1953] This may need to be provided for in statute, although the requirement for a possessory interest is at common law. The nature and results of such an enquiry will depend on the specific type of data object in question.

Sufficient interference

19.116 Second, to establish a claim in conversion, it is necessary to establish a sufficient interference with the claimant's object of property rights. Extending conversion to data objects therefore raises the question as to what constitutes an "interference" in this context. We think this assessment is ultimately a factual one that will depend upon the specific data object in question. For example, where a fraudster transfers a crypto-token from one public address to another, this could, in our view, constitute an interference with the property. Therefore, we think the question of interference with data objects can be answered with reference to the specific facts and by extrapolating from existing principles, without the need for special rules.

A strict liability tort?

19.117 As discussed above, conversion is a strict-liability tort. However, the nature of data objects (in particular crypto-tokens) and the frequency and speed of transactions involving crypto-tokens may create uncertainty for parties if a defendant is not able to raise a defence to a claim in conversion (which they cannot currently do under the existing law). It has been argued that:[1954]

1950 [2020] BCSC 232.

1951 [2019] NZHC 2184 at [254].

1952 See 19.90 above.

1953 We discuss control in Chapter 11.

1954 See L Chambers, "Misappropriation of cryptocurrency: propelling English private law into the digital age?" (2016) 5 *Journal of International Banking and Financial Law* 263, 265.

the creation of a new strict-liability tort would also generate much uncertainty until the courts had settled the scope of the tort and its practical implications in commercial settings; an undesirable result in a fast-moving digital age.

19.118 To provide an example, suppose Bob "converts" Alice's NFT and sells it to a good faith purchaser for value without notice, Caroline. If conversion is extended to data objects, Alice would be able to sue Caroline in conversion. This would be undesirable. As we discuss in Chapter 13,[1955] Caroline (and other market participants similarly placed) might reasonably consider that the idiosyncratic nature of a transfer operation that effects a state change means that the practical consequences of an innocent acquisition rule already apply.

19.119 To protect parties such as Caroline, and to give effect to market expectations, we propose in Chapter 13 that a special defence of (or analogous to) "good faith purchaser for value without notice" should be introduced in the context of data objects in the same way as it exists for money and negotiable instruments.[1956] If such a defence were available, Alice would lose the necessary title to sue Caroline in conversion,[1957] since the superior possessory right would have passed to Caroline as a good faith purchaser for value without notice.

19.120 A special defence of good faith purchaser for value without notice would protect innocent actors who are less likely to be aware that data objects with which they are transacting are converted property. Even though introducing such a defence would have the effect of creating separate regimes for data objects and tangible property in the context of conversion, we think there are justifiable policy reasons for the introduction of such a defence in the context of data objects (in the same way as there are for money and negotiable instruments).

Remedies

19.121 Finally, any award of remedies in conversion would have to be tailored to take account of the nature of data objects and their environment (such as the platform or system on which they are held). For example, it may be practically more difficult to order "delivery" or transfer of a crypto-token than tangible property, particularly where the transaction in question is recorded on a blockchain system. The re-transfer of the crypto-token might require positive steps by the defendant, and perhaps even third parties. This would make an order for specific delivery more akin to a mandatory injunction, which courts are usually far more reluctant to order.[1958] Even so, we think

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[1955] Where we discuss the possible development of a special defence of good faith purchaser for value without in more detail.

[1956] See Chapter 13 from para 13.54; See also S Green and J Randall, *The Tort of Conversion* (2009) p 113.

[1957] S Green and J Randall, *The Tort of Conversion* (2009) p 114: "Ultimately, the transfer of money in good faith and for value deprives the original possessor of the necessary title to sue in Conversion, since the superior possessory right passes to the transferee as a result of the exchange". See also M Jones and A Dugdale, *Clerk & Lindsell on Torts* (23rd ed 2020) para 16-37.

[1958] *Castanho v Brown & Root (UK) Ltd* [1981] AC 557, 574 by Lord Scarman.

these are practical questions which the courts can resolve in the ordinary course without the need for special provision.[1959]

Conclusion on conversion

19.122 In sum, we think there are arguments in favour of extending conversion — or a conversion-type cause of action — to data objects. However, we acknowledge that this would be a step change for the law which would need further consideration. The most compelling argument in favour of extending conversion is that such a reform would ensure that (at least insofar as data objects are concerned) legal protection is afforded to them in the same way as for tangible property, where the same interests are at stake. Any extension of conversion is, however, likely to give rise to various questions, including how to determine the equivalent of possession in the digital context, and what the necessary level of "interference" for a claim in conversion in relation to a data object is. Further, questions arise as to whether suitable defences are necessary to provide parties with sufficient confidence to continue to utilise and transact with data objects.

Consultation Question 43.

19.123 We provisionally conclude that, in relation to the tort of conversion, there are arguments in favour of extending conversion (or a conversion-type cause of action grounded in control rather than possession) to data objects. Do you agree?

19.124 We provisionally conclude that the introduction of a special defence of (or analogous to) good faith purchaser for value without notice (at law) would limit the impact of the application of strict liability for conversion in the context of data objects. Do you agree?

CONSTRUCTIVE TRUST ARISING IN CASES OF THEFT AND FRAUD

The general law

19.125 In cases of theft or fraud, a constructive trust may arise as soon as the object of property rights is received by the thief or fraudster. In these circumstances, the constructive trust can be regarded as a "pragmatic device" enabling the victim to take advantage of equitable remedies, for example, to trace their property through a mixture.[1960]

[1959] See *Tulip Trading Limited v Bitcoin Association for BSV* [2022] EWHC 667 (Ch), where the claimant sought an order requiring the defendants to introduce a software "patch" to enable the claimants to regain control of their assets. On the facts the claim failed on the basis that the claimants could not establish that the defendants were under a sufficient fiduciary duty to take such steps.

[1960] D Fox, *Property Rights in Money* (2008) para 4.106. Nonetheless, as we note at para 19.46 above, there is a strong case that the distinction between the equitable and common law rules of tracing and following is incoherent. There may, however, be other reasons why victims may seek to rely on a constructive trust, given, for instance, the current scope of the law of conversion (see from para 19.89, above).

19.126 In *Westdeutsche Landesbank Girozentrale v Islington LBC,* Lord Browne-Wilkinson considered the example of a thief who stole a bag of coins. He stated (obiter):[1961]

> Although it is difficult to find clear authority for the proposition, when property is obtained by fraud, equity imposes a constructive trust on the fraudulent recipient: the property is recoverable and traceable in equity.

19.127 The meaning of "fraud" in this context appears to be narrowly defined, applying only to those situations in which a defendant commits a "fraudulent appropriation [of property] without any legally effective consent from the victim".[1962] It would not, for instance, encompass a situation in which the defendant induces the victim to transfer property by making a fraudulent misrepresentation. In such a case, although the victim's consent is defective, its presence at the point of transfer means that both legal and beneficial title passes on transfer, and a constructive trust would only arise (if at all) at the point when the victim exercises their right to rescind.[1963]

Points for consideration

19.128 Even though it appears that, in cases of theft or fraud, a constructive trust may arise as soon as the object of property rights is received by the thief or fraudster, a conceptual difficulty arises concerning the nature of the right held on constructive trust by the defendant. This is because in such cases superior legal title does not pass to the thief or fraudster.[1964] One possible answer to this objection, advanced by Professor Fox, is that it is the thief's (purely) possessory title which constitutes the subject of the constructive trust.[1965]

19.129 A constructive trust analysis was adopted by His Honour Stephen Morris QC in *Armstrong DLW GmbH v Winnington Networks Ltd*[1966] in relation to carbon emission allowances known as European Union Allowances ("EUAs"): a type of intangible property. The court acknowledged that the fraudster had acquired "possession" or "control" over the EUAs which gave the fraudster "some form of de facto legal title":

1961 *Westdeutsche Landesbank Girozentrale v Islington LBC* [1996] AC 669, 716 by Lord Browne-Wilkinson; *Armstrong DLW GmbH v Winnington Networks Ltd* [2012] EWHC 10 (Ch), [2013] Ch 156 at [126] to [129] by Stephen Morris QC. The imposition of a trust over stolen money has also long been established in Australia: *Black v S Freedman & Co* (1910) 12 CLR 105; *Creake v James Moore and Sons Pty Ltd* (1912) 15 CLR 426.

1962 D Fox, *Property Rights in Money* (2008) para 4.99.

1963 *Shalson v Russo* [2003] EWHC 1637 (Ch), [2005] Ch 281 at [108] and [111] by Rimer J; *Halifax Building Society v Thomas* [1996] Ch 217, 228 by Gibson LJ: there is no "universal principle that wherever there is a personal fraud the fraudster will become a [constructive] trustee for the party injured by the fraud." See too *Tecnimont Arabia Limited v National Westminster Bank PLC* [2022] EWHC 1172 (Comm) at [99] by HHJ Bird.

1964 *Shalson v Russo* [2003] EWHC 1637 (Ch), [2005] Ch 281 at [109] to [118] by Rimer J. See further: S Thomas, "Thieves as Trustees: The Enduring Legacy of Black v S Freedman & Co Ltd" (2009) 3 *Journal of Equity* 52; J Tarrant, "Thieves as Trustees: In Defence of the Theft Principle" (2009) 3 *Journal of Equity* 170; R Chambers, "Trust and Theft" in E Bant and M Harding, *Exploring Private Law* (2010).

1965 D Fox, *Property Rights in Money* (2008) paras 4.103 to 4.106. This analysis is endorsed in both *Snell's Equity* (34th ed) para 26-012, and *Goff & Jones: The Law of Unjust Enrichment* (9th ed) para 8-68 n 126. See *also Re D & D Wines International Ltd* [2016] UKSC 47, [2016] 1 WLR 3179 at [39] by Lord Sumption.

1966 [2012] EWHC 10 (Ch), [2013] Ch 156 at [276].

Whatever control the fraudster had at that time, I consider that (1) that control gave him some form of de facto legal title and (2) that this did not deprive Armstrong of its beneficial entitlement to those EUAs, and thus (3) all the while the EUAs remained held by the fraudster they were held on constructive trust for Armstrong.

19.130 Even though this decision supports the proposition that a constructive trust can arise in cases of fraud, particularly in the context of certain intangible property, it is not clear whether the judgment supports the analysis suggested by Professor Fox. This is because the proprietary restitutionary claim at law (which requires retention of superior legal title) and the personal claim for knowing receipt arising in equity (which presupposes a loss of superior legal title) were advanced as alternative causes of action or legal bases for the claim.[1967]

19.131 In addition, this aspect of the decision has been criticised on the basis that an EUA is properly conceived of as an intangible right.[1968] The authors of *The Law of Personal Property* suggest that to conceive of a sort of relative title to those types of intangible rights is "a concept which is alien, illogical and contrary to authority".[1969]

Application to data objects

19.132 These principles have already been applied in the context of data objects. For example, in *Osbourne v Ozone Networks Inc,* His Honour Judge Pelling QC held that (there was an arguable case that) fraudsters had removed the claimant's NFTs from her account "without her knowledge or consent," and that, accordingly, those "stolen" assets were held "by the persons unknown on a constructive trust."[1970]

19.133 However, on the facts of the case, it is unclear whether the claimant was the victim of a theft (where the superior legal title to the NFT remained with the victim) or the victim was defrauded in circumstances where the superior legal title passed to the fraudster (and the transaction was subsequently rescinded). Therefore, this case does not provide good authority for the proposition that some form of control-based legal title (or interest) to a crypto-token can be held on constructive trust for a victim who retains the (superior) legal title. Nevertheless, we think that this argument is conceptually more appealing when applied to crypto-tokens than intangible rights or things in action, given the position put forward in this consultation paper that it is possible to separate (superior) legal title to a crypto-token and control of that crypto-token.[1971]

19.134 The question as to when a constructive trust may arise in the context of theft or fraud is not unique to data objects. Given that this is a matter concerning the broader

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1967 [2012] EWHC 10 (Ch), [2013] Ch 156 at [287] where the proprietary restitutionary claim at law was considered in the alternative if "there was no relevant separation of legal and beneficial title".

1968 For a discussion of different types of carbon emission allowances and whether they satisfy our criteria of data objects, see Chapter 9. These criticisms may not apply in the context of data objects, as we discuss below.

1969 M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 15-127.

1970 [2022] EWHC 1021 (Comm) paras [8] and [25]. We also note the recent judgment of the High Court in *D'Aloia v (1) Persons Unknown (2) Binance Holdings Limited & Others* (unreported) where (in the context of permission to serve out of the jurisdiction) the court held that there was a good arguable case that the five defendant crypto-token exchanges held the claimant's identifiable crypto-tokens as constructive trustees.

1971 See in particular, Chapter 13 at para 13.103.

application of trust law and not one specific to data objects, we do not make any provisional law reform proposals on this issue.

INJUNCTIONS

The general law

19.135 An injunction is a court order or remedy by which a party to an action is required to do, or refrain from doing, a particular thing.[1972] The court's jurisdiction to grant injunctions is rooted in section 37 of the Senior Courts Act 1981, which specifies that a court may "grant injunctions in all cases in which it appears to the court just and convenient to do so". Like an order for specific performance, an injunction is an equitable remedy which may be granted as an interim (interlocutory) or as a final remedy.[1973]

19.136 An injunction may be prohibitory (preventing a party from doing something) or mandatory (compelling them to do something).[1974] Whether it is "just and convenient" to grant an injunction will depend on the particular circumstances of the case, including whether damages are an adequate remedy instead.[1975] A mandatory injunction is generally more difficult to obtain than a prohibitory injunction, since it requires the defendant to perform (rather than refrain from performing) a particular act.[1976]

19.137 Where an interim prohibitory injunction is sought, the claimant must show that there is a serious issue to be tried, and that the "balance of convenience" favours awarding the interim injunction.[1977]

Freezing order

19.138 A freezing order or a freezing injunction (formerly known as a *Mareva* injunction) is a type of interim prohibitory injunction intended to prevent the dissipation of assets outside of the ordinary course of business in a way which would render any future judgment unenforceable.[1978] A freezing order operates *in personam*, and does not produce proprietary rights in respect of the assets themselves.[1979] Like other interim injunctions, a freezing order can only be awarded where it is "just and convenient" to do so.[1980] Among other things, a party would have to prove that they have a good

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1972 *Jowitt's Dictionary of English Law* (5th ed 2019).

1973 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 161.

1974 Above p 163.

1975 Senior Courts Act 1981, s 37(1).

1976 *Shepherd Homes Ltd v Sandham* [1970] 3 All ER 402; *Co-operative Insurance Society Ltd v Argyll Stores (Holdings) Ltd* [1997] 3 All ER 297.

1977 M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 34-044.

1978 *Crowther v Crowther* [2020] EWCA 762, [2020] Fam Law 1167 at [48] by Males LJ, quoting *Vneshprombank LLC v Bedzhamov* [2019] EWCA Civ 1992.

1979 *Ninemia Maritime Corporation v Trave Schiffahrtsgellschaft MbH* [1983] 1 WLR 1421, [1984] 1 ALL ER 398.

1980 *Candy v Holyoake* [2017] EWCA Civ 92, [2017] 3 WLR 1131.

arguable case, and provide evidence to demonstrate that the defendant has assets which they are at risk of dissipating.[1981]

19.139 The courts may also award a worldwide freezing order, which would inhibit a defendant from dealing with, or disposing of, their assets anywhere in the world.[1982] Whether a worldwide freezing order is granted depends on, among other things, factors such as the sufficiency of assets located in England and Wales, whether it would be oppressive to make a worldwide freezing order, and whether there are foreign assets at risk of disposal.[1983]

Proprietary injunction

19.140 A proprietary injunction (also a type of interim prohibitory injunction) differs from a freezing order insofar as it prevents a defendant from dealing with, or disposing of, assets in respect of which a proprietary claim has been made.[1984] The distinction between a freezing order and a proprietary injunction has been explained as follows.[1985]

> The ordinary *Mareva* [freezing] injunction restricts a defendant from dealing with his own assets. A [proprietary] injunction, at least in part, restrains the defendants from dealing with assets to which the [claimant] asserts title. It is not designed merely to preserve the defendant's assets so as to be available to meet a judgment; it is designed to protect the [claimant] from having its property expended for the defendant's purposes.

19.141 To obtain a proprietary injunction, a claimant has to show (as with other interim prohibitory injunctions) that there is a serious issue to be tried, and that the "balance of convenience" favours awarding the interim injunction.[1986]

Application of freezing order and proprietary injunction principles to data objects

19.142 Recent court decisions clearly indicate that crypto-tokens are capable of being the subject of proprietary injunctions and freezing orders.[1987] The courts have consistently held that crypto-tokens are appropriate objects of property rights for the purposes of such orders.

1981 *Ninemia Maritime Corporation v Trave Schiffahrtsgellschaft MbH* [1983] 1 WLR 1421, [1984] 1 ALL ER 398, 1417 and 1421 by Kerr LJ.

1982 *Derby & Co Ltd v Weldon* [1990] Ch 48, [1989] 1 All ER 469.

1983 Above at 56 to 57 by Parker LJ.

1984 M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 34-045; *Polly Peck International v Nadir* (No 2) [1994] 3 ALL ER 764.

1985 *Twentieth Century Fox Film Corporation v Harris* [2013] EWHC 159 (Ch), [2014] Ch 41 at [7] by Newey J, quoting Millett LJ in *Ostrich Farming Corporation Ltd v Ketchell* (10 December 1997, unreported).

1986 M Bridge, L Gullifer, K Low, and G McMeel, *The Law of Personal Property* (3rd ed 2021) para 34-044.

1987 See eg, *AA v Persons Unknown and others* [2019] EWHC 3556 (Comm), [2020] 2 All ER (Comm) 704; *Fetch.ai Ltd and another v Persons Unknown Others* [2021] EWHC 2254 (Comm); *Danisz v Persons Unknown* [2022] EWHC 280 (QB), [2022] All ER (D) 107.

19.143 For example, Mr Justice Bryan in *AA v Persons Unknown and Others* (relying on the *UKJT Legal statement on cryptoassets and smart contracts*)[1988] held that:[1989]

> I am satisfied for the purpose of granting an interim injunction in the form of an interim proprietary injunction that crypto currencies are *a form of property capable of being the subject of a proprietary injunction*.

19.144 A proprietary injunction was consequently granted with respect to the bitcoin in that case.[1990] The court similarly ordered a worldwide freezing order and a proprietary injunction in *Fetch*.[1991] In addition, NFTs have been explicitly recognised as "property" for the purposes of a proprietary injunction in England and Wales.[1992] These decisions indicate that crypto-tokens (including NFTs) can form the basis of interim injunctive awards for the reason that they are appropriate objects of property rights.[1993]

19.145 The use of freezing orders and proprietary injunctions can be particularly relevant in cases where one is seeking to restrain misappropriated property.

19.146 In circumstances where the identity of the putative defendants is unknown (as is the case in many instances of theft or fraud), applications for interim relief can be brought against "persons unknown". The court may grant permission to the claimant to effect service by one or more "alternative means",[1994] provided that they can reasonably be expected to draw the proceedings to the attention of the unnamed defendants.[1995] This might include, for instance, allowing claimants to effect service via text message

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1988 UKJT, *Legal Statement on cryptoassets and smart contracts* (November 2019) ("UKJT Statement"), https://technation.io/lawtechukpanel/.

1989 [2019] EWHC 3556 (Comm), [2020] 2 All ER (Comm) 704 at [61] (emphasis added).

1990 *AA v Persons Unknown and others* [2019] EWHC 3556 (Comm), [2020] 2 All ER (Comm) 704 has been followed in *DPP v Briedis and Reskajs* [2021] EWHC 3155 (Admin), and *Danisz v Persons Unknown* [2022] EWHC 280 (QB), [2022] All ER (D) 107.

1991 [2021] EWHC 2254 (Comm).

1992 *Osbourne v (1) Persons Unknown and (2) Ozone Networks Inc trading as Opensea* [2022] EWHC 1021 (Comm).

The Singapore High Court also recently awarded a proprietary injunction with respect to a rare Bored Ape Yacht Club (BAYC) NFT, which the claimant is seeking to repossess from an online persona: see https://www.bloomberg.com/news/articles/2022-05-20/bored-ape-nft-barred-from-sale-by-singapore-court-after-dispute.

1993 See also the decision of the British Virgin Islands High Court in *Chainswap v Persons Unknown* BVIHC (COM) 2022/0031https://www.eccourts.org/chainswap-limited-v-the-owner-of-digital-wallet-et-al/, where the court considered an application to continue a worldwide freezing order against persons who were allegedly involved in the theft of digital assets. It is also worth noting that issues may arise as to the availability of ancillary relief where the defendant is located outside the jurisdiction: *Fetch.ai Ltd and another v Persons Unknown Others* [2021] EWHC 2254 (Comm) has cast doubt over whether *Norwich Pharmacal* relief was available for entities located abroad. Such an order, which compels persons to disclose the identity of a wrongdoer, may be important where the identities of the defendant are unknown: *Norwich Pharmacal Co v Customs and Excise Commissioners* [1974] AC 133, [1973] 3 WLR 164.

1994 Civil Procedure Rules r 16.5.

1995 *Cameron v Liverpool Victoria Insurance Co Ltd (Motor Insurers' Bureau Intervening)* [2019] UKSC 6, [2019] 1 WLR 1471; *Barking and Dagenham London Borough Council v Persons Unknown* [2021] EWHC 1201 (QB) at [31] to [34], [43] to [48] and [164] to [166] by Nicklin J. See further: *The White Book* (2022) para 6.15.1.1.

to a phone number used to make blackmail threats.[1996] Recently, the High Court granted permission for the claimant to serve proceedings by way of NFT airdrop to the two public addresses into which the claimant initially deposited their crypto-tokens, in addition to service by email.[1997] Courts in other jurisdictions have also permitted claimants to effect service by sending a crypto-token to the defendant's public address, featuring a link to a website hosting relevant legal documents (such as orders and witness statements).[1998] This may be a useful mechanism for claimants and their advisors to consider, in cases where crypto-tokens can be traced to an identifiable public address, but where other more orthodox methods of service are impracticable.

19.147 In light of the analysis above, there is sufficient judicial precedent for the conclusion that crypto-tokens can be the subject matter of proprietary injunctions and freezing orders (including worldwide freezing orders) on the basis that they are objects of property rights. We see no reason why other types of data objects, as distinct objects of property rights, could not similarly form the subject matter of such awards. We therefore provisionally conclude that no law reform is required to existing principles of injunctive relief to accommodate specifically any particular types of data object.

Consultation Question 44.

19.148 We provisionally conclude that existing principles in relation to injunctive relief can apply to data objects, without the need for law reform. Do you agree?

Consultation Question 45.

19.149 Are there any other causes of action or remedies you think may be highly or specifically relevant to data objects but which require law reform?

ENFORCEMENT

19.150 In cases where an unsuccessful defendant (sometimes described as a "judgment debtor") does not voluntarily comply with a court order or judgment, the successful claimant (sometimes described as a "judgment creditor") will be required to take steps to enforce their judgment.

1996 *LJY v Persons Unknown* [2017] EWHC 3230 (QB), [2018] EMLR 19.

1997 *D'Aloia v (1) Persons Unknown (2) Binance Holdings Limited & Others* (unreported).

1998 J Adamowski, "'First Time Ever', US Law Firm Airdrops NFT Subpoena in Exchange Hack Case" (June 2022): https://cryptonews.com/news/first-time-ever-us-law-firm-airdrops-nft-subpoena-in-exchange-hack-case.htm. The on-chain process can be viewed at: https://etherscan.io/nft/0xdc9ec0c966c3d3a552a228b3fe353848ce2f25f4/1. The crypto-token links to legal documents hosted at: https://www.hklaw.com/en/general-pages/lcx-ag-v-doe. We discuss linking crypo-tokens further in Chapter 14.

19.151 A judgment creditor may elect from any available methods of enforcement (combining them as they see fit, whether simultaneously and/or sequentially). Depending on the circumstances, these might include: the appointment of a receiver,[1999] third-party debt orders,[2000] charging orders,[2001] and/or an attachment of earnings.[2002]

19.152 Some academics and practitioners have raised concerns about the effectiveness of existing enforcement mechanisms in the context of certain crypto-tokens. For example, Professor Low has warned that blockchain technology could "blunt" many judicial remedies (including in litigation more generally) in situations where the defendant's crypto-tokens "are required to be seized to satisfy a judgment debt". This is because, in practice, it will be nigh impossible to seize crypto-tokens controlled by a recalcitrant judgment debtor who refuses to voluntarily disclose their private key.[2003]

19.153 We share the view of the UKJT statement that "the design of [crypto-tokens] may create some practical obstacles to legal intervention".[2004] It is important to recognise, however, that these difficulties are not necessarily unique to crypto-tokens.

19.154 The law has always had to deal with the risk that defendants refuse to comply with court orders and has accordingly developed remedies designed to compel (or at least highly incentivise) compliance. For example, assume that Alice successfully obtains an order for delivery up of some gold bars which have been stolen (converted) from her, but that Bob decides to hide them rather than comply with the order. In practice, Alice will be forced to settle for a claim of damages in lieu (in the hope that this can be enforced against Bob's other assets, assuming they exist and can be discovered). Further, Alice can make an application to have Bob committed for contempt of court, exposing him to the threat of sanctions such as imprisonment and/or sequestration of his assets.

1999 Part 69 of the Civil Procedure Rules. "Where it proves impossible to obtain the co-operation of a judgment debtor, or of any person ordered by the court to perform a particular act, the court may appoint a receiver to carry out the act as directed by the court": *Zuckerman on Civil Procedure* (4th ed) para 24.67.

2000 Part 72 of the Civil Procedure Rules; formerly known as garnishee proceedings. This mechanism "enables a judgment creditor to obtain an order compelling a third party who holds assets for or owes a debt to the judgment debtor to pay such sums directly to the judgment creditor in satisfaction of the judgment": *Zuckerman on Civil Procedure* (4th ed) para 24.38.

2001 Part 73 of the Civil Procedure Rules; the Charging Orders Act 1979. This mechanism allows the Court to impose a charge (securing payment due under the relevant judgment or order) on interests in land, securities (such as stocks and shares), and/or the defendant's interests in partnership property: *Zuckerman on Civil Procedure* (4th ed) para 24.51.

2002 Part 89 of the Civil Procedure Rules; The Attachment of Earnings Act 1971. This type of order (only available in the County Court) is "directed to the judgment debtor's employer, and operates as an instruction to the employer to periodically withhold amounts from the judgment debtor's earnings, and to pay the deductions to the county court collecting officer": *Zuckerman on Civil Procedure* (4th ed) para 24.48.

2003 K Low, "Confronting Cryptomania: Can Equity Tame the Blockchain?" (2020) 14 *Journal of Equity* 240. See also J Ramsden, "Possessable or non-possessable? OBG v Allan and the future of intangibles" (2021) *Journal of International Banking and Financial Law* 626, 627. We note however that this is an intentional technical feature (as opposed to a bug) of many crypto-token systems.

2004 UKJT Statement para 42.

19.155 Similarly, difficulties in discovering the identities of defendants (possibly compounded by cross-border challenges) are commonly encountered (and successfully overcome) by claimants attempting to recover other types of property and/or enforce judgment debts by realising other types of assets.[2005]

19.156 We envisage that, in some circumstances, it may be possible to obtain control over crypto-tokens without the (full) cooperation of a judgment debtor. For example, the relevant private keys may be revealed in the course of disclosure,[2006] or discovered during a search of the defendant's premises.[2007] If a judgment creditor were able to discover a judgment debtor's private key, they might be able to obtain an order (pursuant to s 39 of the Senior Courts Act) for a nominated person to execute a transfer or conveyance.[2008] Alternatively, if crypto-tokens are in the custody of a third-party, it might be possible to obtain control with the (possibly enforced) assistance of a relevant third-party (such as an exchange).[2009]

19.157 Though we do not at present propose any changes in this area, we are interested in the general views of consultees as to whether existing methods of enforcement (and ancillary mechanisms) are satisfactory and, if not, how they could usefully be developed.

2005 In many cases involving data objects, monetary damages will be an adequate remedy for the claimant and the defendant will have other assets which could be seized and realised, even if they refuse to disclose their private key. In cases involving crypto-tokens linked to assets external to the crypto-token system (see Chapter 14). It may also be possible to seize and realise these linked/external assets, even if this severs the link between the crypto-token and the external thing: K Low, "Confronting Cryptomania: Can Equity Tame the Blockchain?" (2020) 14 *Journal of Equity* 240.

2006 Part 31 of the Civil Procedure Rules. Disclosure here is used in the non-technical sense to refer to the entire process of revealing the existence of documents and providing access to them to other parties. See further: *Zuckerman on Civil Procedure* (4th ed) ch 15.

2007 T Grant, D Mumford, *Civil Fraud: Law, Practice & Procedure* (1st ed) para 30-002: "In an exceptional case (for example where the oral examination of the judgment debtor under CPR 71 is unlikely to be or has not been effective), it may be possible to apply for a search order after judgment for the purpose of securing documentary evidence which is essential to execution", citing *Distributori Automatici v Holford Trading Co* [1985] 1 WLR 1066, 1074, and *Abela v Baadarani (No 2)* [2017] EWHC 269 (Ch), [2018] 1 WLR 89 (a case where there had been oral examination of the judgment debtor under CPR 71, but the debtor had failed to produce disclosure which he had been ordered to give as a result of that examination). See further: K Low, "Confronting Cryptomania: Can Equity Tame the Blockchain?" (2020) 14 *Journal of Equity* 240.

2008 Following failure by the defendant to comply with a court order to execute a document authorising the claimant to transfer the crypto-token. We understand that no such order or argument has been made to date in respect of crypto-tokens, and do not conclude on whether such an order would likely be granted by a court.

2009 This would depend on the precise nature of the custody relationship: see Chapter 16 from para 9. It also seems unlikely that this could be achieved using a third-party debt order, given that Part 72 of the Civil Procedure Rules refers to "money" owed to a judgment debtor by a third-party located within the jurisdiction.

Consultation Question 46.

19.158 We provisionally conclude that the existing methods of enforcement of judgments (and ancillary mechanisms) in the context of crypto-tokens are satisfactory. Do you agree?

AWARDS DENOMINATED IN CRYPTO-TOKENS

19.159 When a court in England and Wales orders a losing party to pay a sum of money, that sum is typically denominated in pounds sterling. Nonetheless, since the decision of the House of Lords in *Miliangos v George Frank (Textiles) Ltd*,[2010] courts have recognised that they have the power to award monetary remedies denominated in foreign currencies. An example would be where this would provide a better reflection of the innocent party's loss.[2011]

19.160 We are not aware of any existing precedent which suggests that courts in England and Wales have the power to award monetary remedies denominated in crypto-tokens. We consider that this is partly because, as noted at paragraph 19.20 above, crypto-tokens are, at present, unlikely to be regarded as money or currency (or analogous thereto).[2012] We therefore agree with Professor Dickinson's conclusion that:[2013]

> Although no decision in point can be found, it appears highly unlikely that line of case law [permitting monetary remedies to be denominated in foreign currencies] would be extended to allow monetary awards in [crypto-tokens] as a matter of course. … The ordinary remedy in English law for the non-delivery of a [crypto-token] will be a claim for unliquidated damages for breach of contract, with judgment being denominated in sterling or in an appropriate foreign currency.

19.161 In light of the fact that, at present, crypto-tokens are unlikely to be regarded as money under the law of England and Wales, the question that arises is whether a court should nonetheless retain the discretion to award a "monetary" remedy

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2010 [1976] AC 443, overturning over 400 years of precedent. Since at least 1605, courts had assumed that they were unable to give judgment in a foreign currency: *Rastell v Draper* (1605) Yelv 80. The decision in *Miliangos* was subsequently extended to cases involving breach of contract, tort and unjust enrichment, including where the applicable law of the contract is English law: *Dicey, Morris & Collins on the Conflict of Laws* (15th ed 2012) para 37-086.

2011 *The Despina R* [1979] AC 685. Note that the "money of account" in which a judgment debt is expressed (or measured) need not necessarily be equivalent to the currency in which the liability is to be discharged (described as the "money of payment"). A sum payable in this jurisdiction, under a contract governed by the law of England and Wales, may be paid in units of the money of account or in sterling. If payment is tendered in sterling the rate of exchange is the rate at which, on the date when payment is due, units of the money of account can be purchased in London at a recognised and accessible market, irrespective of the official rate of exchange: *Marrache v Ashton* [1943] AC 311.

2012 As discussed in Chapter 13 and Chapter 18, this issue is technically outside the scope of this consultation paper.

2013 A Dickinson, "Cryptocurrencies and the Conflict of Laws" in D Fox and S Green, *Cryptocurrencies in Public and Private Law* (2019) para 5.91.

denominated in crypto-tokens in certain circumstances.[2014] On its face, it would arguably be a radical step to allow damages, for example, to be denominated by reference to a commodity. If a court were to award damages denominated by reference to a particular crypto-token, it would technically be ordering the transfer of (non-monetary) objects of property rights. There appears to be no recent precedent for an award of damages denominated in, say, gold bars, barrels of crude oil, or bushels of wheat.

19.162 We recognise, however, that there are policy arguments which could justify providing the courts in England and Wales with the discretion to award a "monetary" remedy denominated in (certain types of) crypto-tokens in appropriate cases.

19.163 First, the law has already recognised the utility of awarding monetary remedies in foreign currency, on the basis that this provides the most accurate reflection of the claimant's loss.[2015] The same proposition might arguably be (or in future become) true in cases where, for example, the parties have contracted using a crypto-token as their medium of exchange. Denominating the award by reference to that particular crypto-token might help to avoid disputes over the appropriate date for conversion into sterling. There is already precedent for arbitral awards denominated in crypto-tokens, for example, in a case involving a contract for a 30-day loan of 1,13662301 bitcoin, at an interest rate of 3.25%.[2016] Further, some countries have now begun recognising certain crypto-tokens as legal tender.[2017] It follows that there may soon come a point at which an award rendered in a foreign currency will therefore be an award denominated in crypto-tokens.

19.164 Second, although an award of damages (for example) is traditionally denominated in money, it appears to us that there is no compelling conceptual reason why secondary obligations must be expressed or enforced in this way in all cases. Parties are already entitled to agree that, on the breach of a primary obligation, the defaulting party will be required to transfer a specified number of crypto-tokens or other property to the

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2014 We discuss this in the context of an action for the agreed sum above from paras 19.19–19.25. There, we make the argument that if and when crypto-tokens are treated in a general sense as money (or analogous thereto) there will be a legitimate basis for those crypto-tokens to be considered the subject matter of an award of an agreed sum, and therefore an action in debt (but not before). We do not think it would be appropriate for an action for the agreed sum (which is effectively an award that seeks to enforce the primary obligation under a contract) to be denominated in crypto-tokens until such time as those crypto-tokens are considered to be money (or analogous thereto) because, as discussed above, that would be tantamount to awarding specific performance as of right. The discussion in this section therefore does not apply to an action for the agreed sum, in relation to which different policy considerations arise. The focus is on other, secondary remedies awarded by the court, such as damages for breach of contract or tort, or equitable compensation, which are generally treated as actions for damages.

2015 *The Despina R* [1979] AC 685, 700 by Lord Wilberforce.

2016 Unreported. An application for recognition and enforcement of the arbitral award (issued in the United States) in Greece was unsuccessful at first instance (Agrinio, 23.10.2018) and on Appeal (Western Continental Greece Court of Appeal, 27.09.2021). See further: Apostolos Anthimos, "Bitcoin and public policy in the field of international commercial arbitration," (2022): https://conflictoflaws.net/2022/bitcoin-and-public-policy-in-the-field-of-international-commercial-arbitration/.

2017 Such as El Salvador and the Central African Republic: S Perez, C Ostroff, "El Salvador Becomes First Country to Adopt Bitcoin as National Currency" (September 2021): https://www.wsj.com/articles/bitcoin-comes-to-el-salvador-first-country-to-adopt-crypto-as-national-currency-11631005200.

innocent party.[2018] It might, therefore, seem a small step to provide courts with the discretion to make an order for damages denominated in a crypto-token also in the case of unliquidated damages.

19.165 Third, many of the key objections to awarding damages denominated in units of a commodity arguably do not apply in relation to (certain kinds of) crypto-tokens.

(1) Many types of crypto-tokens are treated by market participants, in practice, as completely fungible.[2019] Where such crypto-tokens are in issue in a case, a judgment creditor is unlikely to care which of the debtor's crypto-tokens are used to satisfy the judgment debt. The fungibility[2020] of such crypto-tokens would help to avoid potential disputes over, for example, the quality or condition of the crypto-token transferred in purported satisfaction of the judgment debt. This is not necessarily true of gold bars, barrels of crude oil, or bushels of wheat.

(2) Depending on the crypto-token in question, there is already a large available market to which either party can resort readily to satisfy or liquidate the judgment debt. Again, this might not be consistently true for all commodities (or even all crypto-tokens).[2021]

(3) Crypto-tokens can be easily stored, received and/or transferred at relatively little expense between the judgment debtor and judgment creditor. The position might be otherwise in the case of, for example, a large judgment debt denominated in a relatively cheap commodity (say, bushels of wheat).

19.166 Fourth, we think that such a reform might help cater for the commercial expectations of parties dealing with crypto-tokens. Such persons may be uninterested in the technical legal question as to the precise classification of a given crypto-token as money or otherwise.[2022] Where parties have been contracting using crypto-tokens they can, as in the case of foreign currency, be taken to have accepted the risk of value fluctuations and/or make arrangements to hedge against this risk. In such a

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[2018] See *Cavendish Square Holding BV v Makdessi and Parking Eye Ltd v Beavis* [2015] UKSC 67, [2016] AC 1172, where the sanctions on breach required the defendant to transfer shares back to the claimant, and forfeit a sum of money. These clauses are generally not enforceable as of right, even if they do not constitute penalties, given the court's discretion to refuse to order specific performance of these (secondary) obligations.

[2019] Plainly, this is not true for all data objects, including, for example, non-fungible tokens ("NFTs"), discussed in Chapter 15.

[2020] That is, the agreement of the parties in dispute that they would be willing to treat certain crypto-tokens as mutually interchangeable.

[2021] In any event, it is doubtful whether and to what extent the lack of a consistently available market is a persuasive objection to reform. At least historically, there was not always an available exchange market for foreign currency (for example, due to the imposition of exchange controls): *Re Parana Plantations Ltd* [1946] 2 All ER 214. This reality may underlie the rule that a sum payable in England under a contract governed by English law may be paid in units of the money of account or in sterling: *Marrache v Ashton* [1943] AC 311.

[2022] See however our discussion above at para 19.23 where we consider that, in insolvency proceedings the characterisation of crypto-tokens could be very important for the purposes of valuing a creditors' claim.

case, a judgment denominated in crypto-tokens may correspond better to the contractually agreed risk allocation between the parties.

19.167 For these reasons, we consider that there is an arguable case for reform to provide courts with the discretion to award a remedy, which is traditionally in money, in certain crypto-tokens in appropriate cases. We do not make a proposal, but ask for consultees' views below.

Consultation Question 47.

19.168 We provisionally conclude that there is an arguable case for law reform to provide courts in England and Wales with the discretion to award a remedy (where traditionally denominated in money) denominated in certain crypto-tokens in appropriate cases. Do you agree?

19.169 If so, what factors should be relevant to the exercise of this discretion?

Chapter 20: Consultation Questions

Consultation Question 1.

20.1 We provisionally propose that the law of England and Wales should recognise a third category of personal property. Do you agree?

Paragraph 4.101

Consultation Question 2.

20.2 We provisionally propose that, to fall within our proposed third category of personal property, the thing in question must be composed of data represented in an electronic medium, including in the form of computer code, electronic, digital or analogue signals. Do you agree?

Paragraph 5.21

Consultation Question 3.

20.3 We provisionally propose that, to fall within our proposed third category of personal property, the thing in question must exist independently of persons and independently of the legal system. Do you agree?

Paragraph 5.41

Consultation Question 4.

20.4 We provisionally propose that, to fall within our proposed third category of personal property, the thing in question must be rivalrous. Do you agree?

Paragraph 5.73

Consultation Question 5.

20.5 We provisionally propose that a data object, in general, must be capable of being divested on transfer. Do you agree? Please give examples, if any, of when this will not be the case.

20.6 We provisionally propose that divestibility should be regarded as an indicator, or general characteristic of data objects, rather than as a gateway criterion. Do you agree?

Paragraph 5.105

Consultation Question 6.

20.7 We provisionally propose that:

(1) the law of England and Wales should explicitly recognise a distinct third category of personal property; and

(2) a thing should be recognised as falling within our proposed third category of personal property if:

(a) it is composed of data represented in an electronic medium, including in the form of computer code, electronic, digital or analogue signals;

(b) it exists independently of persons and exists independently of the legal system; and

(c) it is rivalrous.

Do you consider that the most authentic and appropriate way of implementing these proposals would be through common law development or statutory reform?

Paragraph 5.142

Consultation Question 7.

20.8 We provisionally conclude that media files do not satisfy our proposed criteria of data objects, and therefore that they fall outside of our proposed third category of personal property. Do you agree?

20.9 Regardless of your answer to the above question, do you think that media files should be capable of attracting personal property rights?

Paragraph 6.52

Consultation Question 8.

20.10 We provisionally conclude that program files do not satisfy our proposed criteria of data objects, and therefore that they fall outside of our proposed third category of personal property. Do you agree?

20.11 Regardless of your answer to the above question, do you think that program files should be capable of attracting personal property rights?

Paragraph 6.62

Consultation Question 9.

20.12 We provisionally conclude that digital records do not satisfy our proposed criteria of data objects, and therefore that they fall outside of our proposed third category of personal property. Do you agree?

20.13 Regardless of your answer to the above question, do you think that digital records should be capable of attracting personal property rights?

Paragraph 6.68

Consultation Question 10.

20.14 We provisionally conclude that email accounts do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. Do you agree?

20.15 Regardless of your answer to the above question, do you think that email accounts should be capable of attracting personal property rights?

Paragraph 7.31

Consultation Question 11.

20.16 We provisionally conclude that in-game digital assets do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. Do you agree?

20.17 Regardless of your answer to the above question, do you think that in-game digital assets should be capable of attracting personal property rights?

Paragraph 7.59

Consultation Question 12.

20.18 We provisionally conclude that (DNS) domain names do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. Do you agree?

20.19 Regardless of your answer to the above question, do you think that (DNS) domain names should be capable of attracting personal property rights?

Paragraph 8.26

Consultation Question 13.

20.20 We provisionally conclude that Carbon Emissions Allowances do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. Do you agree?

Paragraph 9.22

Consultation Question 14.

20.21 We provisionally conclude that most VCCs do not satisfy our proposed criteria of data objects and therefore that they fall outside of our proposed third category of personal property. Do you agree?

20.22 Regardless of your answer to the above question, do you think that VCCs should be capable of attracting personal property rights?

Paragraph 9.45

Consultation Question 15.

20.23 We provisionally conclude that crypto-tokens satisfy our proposed criteria of data objects and therefore that they fall within our proposed third category of personal property. Do you agree?

Paragraph 10.139

Consultation Question 16.

20.24 We provisionally propose that the concept of control is more appropriate for data objects than the concept of possession. Do you agree?

Paragraph 11.111

Consultation Question 17.

20.25 We provisionally propose that, broadly speaking, the person in control of a data object at a particular moment in time should be taken to be the person who is able sufficiently:

(1) to exclude others from the data object;

(2) to put the data object to the uses of which it is capable (including, if applicable, to effect a passing of, or transfer of, that control to another person, or a divestiture of control); and

(3) to identify themselves as the person with the abilities specified in (1) to (2) above.

Do you agree?

Paragraph 11.112

Consultation Question 18.

20.26 We provisionally conclude that the concept of control as it applies to data objects should be developed through the common law, rather than being codified in statute. Do you agree?

Paragraph 11.128

Consultation Question 19.

20.27 We provisionally conclude that it would be beneficial for a panel of industry, legal and technical experts to provide non-binding guidance on the complex and evolving issues relating to control and other issues involving data objects more broadly. Do you agree?

Paragraph 11.133

Consultation Question 20.

20.28 We provisionally conclude that a transfer operation that effects a state change within a crypto-token system will typically involve the replacing, modifying, destroying, cancelling, or eliminating of a pre-transfer crypto-token and the resulting and corresponding causal creation of a new, modified or causally-related crypto-token. Do you agree?

20.29 We provisionally conclude that this analysis applies in respect of UTXO based, Account based and token-standard based (both “fungible” and “non-fungible” crypto-token implementations). Do you agree?

Paragraph 12.61

Consultation Question 21.

20.30 We provisionally conclude that the rules of derivative transfer of title apply to crypto-tokens, notwithstanding that a transfer of a crypto-token by a transfer operation that effects a state change involves the creation of a new, causally-related thing. Do you agree?

Paragraph 13.90

Consultation Question 22.

20.31 We provisionally propose that:

(1) A special defence of good faith purchaser for value without notice (an innocent acquisition rule) should apply to a transfer of a crypto-token by a transfer operation that effects a state change. Do you agree?

(2) An innocent acquisition rule should apply to both "fungible" and "non-fungible" technical implementations of crypto-tokens. Do you agree?

(3) An innocent acquisition rule cannot and should not apply automatically to things that are linked to that crypto-token. Do you agree?

Paragraph 13.91

Consultation Question 23.

20.32 We provisionally propose that an innocent acquisition rule in respect of transfers of crypto-tokens by a transfer operation that effects a state change should be implemented by way of legislation, as opposed to common law development. Do you agree?

Paragraph 13.94

Consultation Question 24.

20.33 We provisionally conclude that the rules of derivative transfer of title apply to crypto-tokens and that it is possible to separate (superior) legal title from the recorded state of the distributed ledger or structured record and/or factual control over a crypto-token. Do you agree?

20.34 We provisionally conclude that, over time, the common law is capable of developing rules to assist with the legal analysis as to title and/or priority where disputes arise between multiple persons that have factual control of a crypto-token, and that statutory reform would not be appropriate for this purpose. We consider that those rules will need to be specific to the technical means by which such factual circumstances can arise within crypto-token systems or with respect to crypto-tokens. Do you agree?

Paragraph 13.112

Consultation Question 25.

20.35 We provisionally conclude that it is not appropriate to treat crypto-tokens as analogous to "goods", as currently defined in the Sale of Goods Act 1979 and other related statutes, including the Supply of Goods and Services Act 1982 and the Consumer Rights Act 2015. Do you agree?

Paragraph 13.144

Consultation Question 26.

20.36 We provisionally propose that the law should be clarified to confirm that a transfer operation that effects a state change is a necessary (but not sufficient) condition for a legal transfer of a crypto-token. We consider that this state change condition is more appropriate than the potentially wider condition of "a change of control". Do you agree? Do you agree that such a clarification would be best achieved by common law development rather than statutory reform?

20.37 Accordingly, we provisionally conclude that allowing title to a crypto-token to transfer at the time a contract of sale is formed, but where no corresponding state change has occurred, would be inappropriate. Do you agree?

Paragraph 13.145

Consultation Question 27.

20.38 Are there any other types of link between a crypto-token and a thing external to a crypto-token system that you commonly encounter or use in practice?

20.39 We provisionally conclude that market participants should have the flexibility to develop their own legal mechanisms to establish a link between a crypto-token and something else — normally a thing external to the crypto-token system. As such, we provisionally conclude that no law reform is necessary or desirable further to clarify or specify the method of constituting a link between a crypto-token and a linked thing or the legal effects of such a link at this time. Do you agree?

Paragraph 14.114

Consultation Question 28.

20.40 Do you consider that there are any specific legal issues relating to non-fungible tokens ("NFTs") that would require different treatment from other crypto-tokens under the law of England and Wales?

Paragraph 15.74

Consultation Question 29.

20.41 We provisionally conclude that it is appropriate to draw a distinction between direct custody services (that is, holding crypto-tokens on behalf of or for the account of other persons and having capacity to exercise or to coordinate or direct the exercise of factual control in terms of both its positive and negative aspects) and custodial or other technology-based services that do not involve a direct custody relationship. Do you agree?

Paragraph 16.41

Consultation Question 30.

20.42 We provisionally conclude that, under the law of England and Wales, crypto-token custody arrangements could be characterised and structured as trusts, even where the underlying entitlements are (i) held on a consolidated unallocated basis for the benefit of multiple users, and (ii) potentially even commingled with unallocated entitlements held for the benefit of the custodian itself. Do you agree?

20.43 We provisionally conclude that the best way of understanding the interests of beneficiaries under such trusts are as rights of co-ownership in an equitable tenancy in common. Do you agree?

20.44 Do you consider that providers and users of crypto-token custody services would benefit from any statutory intervention or other law reform initiative clarifying the subject matter certainty requirements for creating a valid trust over commingled, unallocated holdings of crypto-tokens? If yes, please explain what clarifications you think would assist.

Paragraph 16.75

Consultation Question 31.

20.45 We provisionally conclude that a presumption of trust does not currently apply to crypto-token custody facilities and should not be introduced as a new interpretive principle. Do you agree?

Paragraph 16.107

Consultation Question 32.

20.46 We provisionally propose that clarification of the scope and application of section 53(1)(c) LPA 1925 would be beneficial for custodians and would help facilitate the broader adoption of trust law in structuring custody facilities, in relation to crypto-tokens specifically and/or to other asset classes and holding structures, including intermediated investment securities. Do you agree?

20.47 If you think that clarification of the scope and application of section 53(1)(c) LPA 1925 would be beneficial, what do you think would be the best way of achieving this? Please indicate which (if any) of the models suggested in the consultation paper would be appropriate, or otherwise outline any further alternatives that you think would be more practically effective and/or workable.

Paragraph 17.58

Consultation Question 33.

20.48 We provisionally propose that legislation should provide for a general pro rata shortfall allocation rule in respect of commingled unallocated holdings of crypto-tokens or crypto-token entitlements in a custodian insolvency. Do you agree?

Paragraph 17.81

Consultation Question 34.

20.49 We provisionally conclude that extending bailment to crypto-tokens, or the creation of an analogous concept based on control, is not necessary at this time. Do you agree?

If not, please provide specific examples of market structures or platforms that would benefit from being arranged as bailments, that could not be effectively structured using the trust and/or contract frameworks currently available.

Paragraph 17.103

Consultation Question 35.

20.50 We provisionally conclude that crypto-tokens, as objects of personal property rights, can be the subject of title transfer collateral arrangements without the need for specific law reform to provide for this. Do you agree?

Paragraph 18.17

Consultation Question 36.

20.51 We provisionally conclude that non-possessory securities can be satisfactorily granted in respect of crypto-tokens without the need for law reform. Do you agree?

Paragraph 18.26

Consultation Question 37.

20.52 We provisionally conclude that it is not desirable to make provision for data objects to be the subject of possessory securities such as the pledge, or to develop analogous security arrangements based on a transfer of control. Do you agree?

If not, please provide specific examples of market structures or platforms that would benefit from the availability of possessory security arrangements, that could not be effectively structured using the non-possessory security frameworks currently available.

Paragraph 18.44

Consultation Question 38.

20.53 We provisionally conclude that the Financial Collateral Arrangements (No 2) Regulations 2003, SI 2003 No 3226 (the "FCARs") should not be extended to more formally and comprehensively encompass crypto-token collateral arrangements. Do you agree?

Paragraph 18.47

Consultation Question 39.

20.54 We provisionally conclude that it would be beneficial to implement law reform to establish a legal framework that better facilitates the entering into, operation, rapid, priority enforcement and/or resolution of crypto-token collateral arrangements. Do you agree?

If so, do you have a view on whether it would be more appropriate for any such law reform to aim to create: (i) a unified, comprehensive and undifferentiated regime for financial collateral arrangements involving both traditional types of financial collateral and crypto-tokens; or (ii) a bespoke regime for financial collateral arrangements in respect of crypto-tokens?

Paragraph 18.113

Consultation Question 40.

20.55 We provisionally conclude that an action to enforce an obligation to "pay" non-monetary units such as crypto-tokens would (and should) be characterised as a claim for unliquidated damages, unless and until crypto-tokens are generally considered to be money (or analogous thereto). Do you agree?

Paragraph 19.26

Consultation Question 41.

20.56 We provisionally conclude that tracing (rather than following) provides the correct analysis of the process that should be applied to locate and identify the claimant's property after transfers of crypto-tokens by a transfer operation that effects a state change, and that the existing rules on tracing (at equity and common law) can be applied to crypto-tokens. Do you agree?

20.57 Do you consider that the common law on tracing into a mixture requires further development or law reform (whether generally or specifically with respect to crypto-tokens)?

Paragraph 19.52

Consultation Question 42.

20.58 We provisionally conclude that the following existing legal frameworks can be applied to data objects, without the need for statutory law reform (although the common law may need to develop on an iterative basis):

(1) breach of contract;

(2) vitiating factors;

(3) following and tracing;

(4) equitable wrongs;

(5) proprietary restitutionary claims at law; and

(6) unjust enrichment.

Do you agree?

Paragraph 19.88

Consultation Question 43.

20.59 We provisionally conclude that, in relation to the tort of conversion, there are arguments in favour of extending conversion (or a conversion-type cause of action grounded in control rather than possession) to data objects. Do you agree?

20.60 We provisionally conclude that the introduction of a special defence of (or analogous to) good faith purchaser for value without notice (at law) would limit the impact of the application of strict liability for conversion in the context of data objects. Do you agree?

Paragraph 19.123

Consultation Question 44.

20.61 We provisionally conclude that existing principles in relation to injunctive relief can apply to data objects, without the need for law reform. Do you agree?

Paragraph 19.148

Consultation Question 45.

20.62 Are there any other causes of action or remedies you think may be highly or specifically relevant to data objects but which require law reform?

Paragraph 19.149

Consultation Question 46.

20.63 We provisionally conclude that the existing methods of enforcement of judgments (and ancillary mechanisms) in the context of crypto-tokens are satisfactory. Do you agree?

Paragraph 19.158

Consultation Question 47.

20.64 We provisionally conclude that there is an arguable case for law reform to provide courts in England and Wales with the discretion to award a remedy (where traditionally denominated in money) denominated in certain crypto-tokens in appropriate cases. Do you agree?

20.65 If so, what factors should be relevant to the exercise of this discretion?

Paragraph 19.168

Appendix 1: Terms of reference

The Law Commission is asked to:

(1) Set out the current law in relation to crypto/intangible assets, drawing on the conclusions of the UK Jurisdiction Taskforce's legal statement (with reference to the questions listed in part A of the Appendix, and the questions in part B where the Law Commission considers this to be appropriate).

(2) Make recommendations to solve the problems caused by English law's approach to the "possession" of crypto/intangible assets, based on a comprehensive review of the law in England and Wales and a brief comparative analysis of the approach in other jurisdictions.

(3) Make such other recommendations as the Law Commission considers necessary or desirable to ensure that the law is capable of accommodating

(4) crypto/intangible assets insofar as the timetable allows.

(5) Identify areas for future consideration – this could cover both wider crypto/intangible assets issues and/or smart contracts.

The Law Commission's work at this stage will not include:

(6) Producing draft legislation to implement our recommendations.

(7) Questions as to jurisdiction or choice of law.

(8) Other areas of law insofar as they relate to crypto/intangible assets such as tax, data protection etc.

ANNEX TO TERMS OF REFERENCE

Part A: key questions

1.2 Under what circumstances, if any, would the following be characterised as personal property:

(1) a crypto/intangible asset;

(2) a private key?

1.3 In particular:

(1) What are the key characteristics that a crypto/intangible asset must have to be considered property?

(2) What characteristics would prevent a crypto/intangible asset from being considered property?

1.4 If a crypto/intangible asset is capable of being property:

(1) Is that as a thing in possession, a thing in action or another category of property?

(2) How is title to that property capable of being transferred?

1.5 Is a crypto/intangible asset capable of being the object of a bailment?

1.6 Can security validly be granted over a crypto/intangible asset and, if so:

(1) How?

(2) What forms of security may validly be granted over a crypto/intangible asset?

1.7 Can a crypto/intangible asset be characterised as "property" for the purposes of the Insolvency Act 1986?

1.8 Can crypto/intangible assets be characterised as "goods" under the Sale of Goods Act 1979?

1.9 In what circumstances is a distributed ledger capable of amounting to a register for the purposes of evidencing, constituting and transferring title to assets?

Part B: Possible additional questions for consideration

1.10 If crypto/intangible assets can be characterised as property:

(1) What are the key characteristics that a DLT system must have so that crypto/intangible assets on that system can be considered property?

(2) What characteristics would prevent any crypto/intangible assets on a DLT system being considered property?

1.11 The Legal Statement found that private/public keys in themselves are not private property.[2023]

(1) Does the Law Commission agree?

(2) If so, what are the implications for cryptoasset wallets (especially in a theft scenario)?

1.12 Crypto/intangible assets may be represented "off-chain" (outside the DLT) by other digital assets. Crypto/intangible assets may also be linked to underlying physical assets.[2024] In such case:

(1) How are assets, services or other things that are linked to cryptoassets to be treated?

(2) Would linkage create separate legal rights, such that bailment is possible in certain circumstances?

1.13 Could a crypto/intangible asset be characterised as:

(1) a documentary intangible?

(2) a document of title?

(3) negotiable?

(4) an "instrument" under the Bills of Exchange Act 1882?

[2023] There are wallet providers for many cryptoassets. These companies provide cryptoasset wallets which store public and/or private keys which can be used to track ownership of a cryptoasset, but they do not store the cryptoasset itself which remains on the decentralised DLT. Germany has developed specific regulation to cover wallet providers. See Legal Statement paras 43 and 65. The Legal Statement considers a cryptoasset as consisting of a "parameter" of data, including private keys.

[2024] See Eversheds Sutherland's commentary on the role of the underlying asset.

Appendix 2: Acknowledgements

Advisory panel

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Peter Hunn

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The following bodies and individuals responded to our call for evidence

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Professor Duncan Sheehan

Professor Jason Grant Allen

Professor Kelvin FK Low

Professor Luke Rostill

Professor Sir Roy Goode QC

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Businesses and financial institutions

D2 Legal Technology

Euroclear UK & Ireland Limited

Twindig (Anthony Codling)

Village Mall Pty Ltd (Charles Moore)

Law firms

Herbert Smith Freehills

Linklaters

Norton Rose Fulbright (Adam Sanitt)

Groups and associations

Blockchain and Climate Institute (Clare Reynolds)

Cloud Legal Project (David Michels)

Digital Law Association

Financial Law Committee of the City of London Law Society

The Law Society

Residential Logbook Association

STEP (Robert Carrington)

The Association for Financial Markets in Europe

The Association of Global Custodians – European Focus Committee (John Siena)

The British and Irish Law Education Technology Association (Felipe Moreno)

The Centre for Commercial and Common Law, University of Aberdeen

The Digital Alliance Institute for Digital Financial Research (Ronald Yuan and Yushi Chen)

The Financial Markets Law Committee

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Government and public bodies

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HM Land Registry

HM Revenue and Customs

HM Treasury

Intellectual Property Office

Scottish Government

The Bank of England

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Professor Stephen Watterson

Professor Tatiana Cutts

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Everledger

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Tech Nation

Trustology

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Clifford Chance

CMS

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Peter Hunn

Peter Werner

Racheal Muldoon

Simon Deane-Johns

Wendy Harrison

Zoe Wyatt

Appendix 3: Indicative functionality of crypto-tokens

INTRODUCTION

3.1 This appendix considers in greater detail two general functions of crypto-tokens within crypto-token systems. First, that it is generally possible to identify a crypto-token within a crypto-token system. Second, a crypto-token will generally have an operative function within a crypto-token system (and it is normally possible to regulate access to that operative function).

3.2 The functions described in this Appendix are not exhaustive. Nor will every crypto-token have the same functionality. Even if it does have one of the functions described in this Appendix, the technical implementation and practical realisation of that function is likely to vary significantly across distinct crypto-tokens. Nevertheless, the descriptions in this Appendix reflect the functions of some existing crypto-tokens and are merely intended to be useful demonstrative examples. Together with Appendix 4 and Appendix 5 below, Appendix 3 provides some more detail on how we think that our concept of a crypto-token as a data object can be applied across various token implementations.

IDENTIFYING FUNCTION

3.3 One important function of a crypto-token is an *identifying* function. In general, a crypto-token will include some form of (often public) data that specifies, is linked to, or references information about the crypto-token itself.

3.4 For example, the crypto-token might specify, be linked to, or reference information about the quantity of the notional unit of account it represents. It might also specify, be linked to, or reference some, or all, of the transaction history of that notional unit of account.

3.5 In simple terms, a crypto-token is likely to have a function that tells you "what" crypto-token you have and "how much", or the quantity of that crypto-token you have. For example, a person might control 1.5 bitcoin, 20 ether, 100 USDT and 1 CryptoPunk. Each of those four crypto-tokens works in a technically different way, but all four have a functionality which allows that person (and others) to identify "what" crypto-token(s) that person controls, and the quantity of each crypto-token.

UTXO-based systems

3.6 In the Bitcoin system, every bitcoin transaction creates a transaction output. The Bitcoin distributed digital ledger records (in the form of data) these transaction outputs. Bitcoin full nodes track all available and spendable transaction outputs — known as unspent transaction outputs ("UTXO").[2025] The collection of all UTXO grows as new UTXO are created and shrinks when spendable UTXO are spent or consumed. So,

[2025] A Antonopoulos, *Mastering Bitcoin* (2nd ed 2018) p 119.

every transaction causes a change of state of the UTXO set tracked by the full nodes in the Bitcoin network.

3.7 UTXO, therefore, have an identifying function in that they identify a discrete and indivisible notional quantity of bitcoin, denominated in integer satoshis (the smallest notional bitcoin unit).[2026] Each UTXO has an identifier in the form of its index number and the ID of the transaction in which it appears.[2027]

3.8 Not all UTXO-based systems operate in the same way, but the particular crypto-tokens within those systems will, in general, have an identifying function. Under the Zcash protocol,[2028] for example, a "coin"[2029] has an identifying serial number, and the "quantity" of the "coin" is identifiable.[2030]

Account-based systems

3.9 Account-based systems such as Ethereum use a different identification method to UTXO-based systems. Account-based systems have been described as "transaction-based state machine[s]".[2031] The system tracks changes to the state of the distributed digital ledger or digital structured record. In the Ethereum system, addresses are mapped to accounts.[2032] Each Ethereum address represents an "account", which is a digital record comprising, among other things, a "balance".[2033]

2026 A Antonopoulos, *Mastering Bitcoin* (2nd ed 2018) p 121.

2027 C Warmke, "Electronic Coins", *Cryptoeconomic Systems* (forthcoming) p 9: https://www.resistance.money/EC.pdf.

2028 Zcash is a decentralised ledger–based digital currency based on a protocol designed to protect user privacy. The purpose of Zcash is to provide users with an instant, risk-free, and automatic guarantee that data revealing their spending habits and account balances are not publicly accessible. In addition, because Zcash permits anonymous transactions, the market value of a "coin" can be made independent of the history of that coin, thus ensuring that legitimate users' coins remain fungible. See E Ben-Sasson, A Chiesay, C Garmanz, M Greenz, I Miersz, E Tromerx and M Virzay, "Zerocash: Decentralized Anonymous Payments from Bitcoin" (2014) *IEEE Symposium on Security and Privacy* 459, p 461.

2029 We accept that the term coin, or electronic coin is more commonly used than the term token or crypto-token for the native notional quantity unit(s) that exist within, and as a result of UTXO-based systems. However, we consider that token or crypto-token is still an appropriate shorthand term for such native notional quantity unit(s). For a detailed discussion on terminology, see C Warmke, "Electronic Coins", *Cryptoeconomic Systems* (forthcoming), p 9: https://www.resistance.money/EC.pdf.

2030 A principal difference being that the "value" of a Zcash "coin" is measured by reference to proof that a certain related quantity of basecoins were made unspendable. See E Ben-Sasson, A Chiesay, C Garmanz, M Greenz, I Miersz, E Tromerx and M Virzay, "Zerocash: Decentralized Anonymous Payments from Bitcoin" (2014) *IEEE Symposium on Security and Privacy* 459, p 461.

2031 See A Antonopoulos and G Wood, *Mastering Ethereum* (2018) p 303, where the authors refer to Ethereum.

2032 UK Jurisdiction Taskforce, *Public consultation: The status of cryptoassets, distributed ledger technology, and smart contracts under English private law* (2019) p 14. The Ethereum Homestead documentation summarises the difference between the Ethereum and Bitcoin blockchains as follows: "Whereas the Bitcoin blockchain was purely a list of transactions, Ethereum's basic unit is the account". See: http://www.ethdocs.org/en/latest/.

2033 A Antonopoulos and G Wood, *Mastering Ethereum* (2018) p 303. UK Jurisdiction Taskforce, *Public consultation: The status of cryptoassets, distributed ledger technology, and smart contracts under English private law* (2019) p 14. We note that account-based systems often support "contract accounts", which facilitate the creation and deployment of smart contracts. These accounts might include digital records of "smart contract code".

3.10 In Ethereum, for example, the balance represents the notional quantity of ether available for a participant to spend.[2034] Further details on the other data points that the state of the distributed digital ledger—or digital structured record—tracks are contained in Appendix 5.

3.11 Crypto-tokens within account-based systems are therefore likely to include a function which allows a person (and others) to identify "what" crypto-token(s) that person controls, and the quantity of each crypto-token within that particular system.

Token implementations

3.12 In addition to crypto-tokens which are specified at the protocol-level,[2035] a number of other token standards (common interfaces for contracts that implement a crypto-token) exist.[2036] Well known examples are the ERC-20[2037] and Solana SPL token standards, and the ERC-721[2038] and Tezos FA2 token standards (the latter two are commonly used to implement "non-fungible tokens" or "NFTs"). These standards are implemented by deploying a smart contract to the underlying protocol, thus modifying or changing the state of the relevant distributed digital ledger or digital structured record. The relevant crypto-token is specified/identified by the functionality of the smart contract.

3.13 This means that balances of crypto-tokens that are created by smart contracts are typically tracked by smart contracts recorded on the relevant distributed digital ledger or digital structured record. Fungible token implementations generally use smart contracts to track balances of tokens that belong to each address, much like balances of "protocol-level" crypto-tokens are tracked at the protocol level. In contrast, NFTs are often issued as ERC-721 tokens, since this token standard has the functionality for tracking specific token IDs and the addresses that own them. These features are intended to facilitate the use of such tokens to represent digital objects that are distinct, unique (or part of a unique series) and indivisible, and in that sense are

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2034 UK Jurisdiction Taskforce, *Public consultation: The status of cryptoassets, distributed ledger technology, and smart contracts under English private law* (2019) p 14.

2035 Some crypto-tokens, such as bitcoin and ether are specified at the protocol level — they are recorded directly by the relevant distributed ledger or structured record in accordance with their respective protocol rules. In other words, the identifying function of the crypto-token arises a result of the application of the protocol rules themselves.

2036 A Antonopoulos and G Wood, *Mastering Ethereum* (2018) p 227.

2037 Token standards are minimum, descriptive standards, and each token smart contract is likely to be implemented in different ways. The internal functioning of the smart contract is not relevant to the standard. The ERC-20 token standard is available at Ethereum, "EIP-20 Token Standard": https://eips.ethereum.org/EIPS/eip-20. Well-known ERC-20 tokens include Chainlink (LINK), Tether (USDT) and Wrapped Bitcion (WBTC). The Solana SPL token standard is available at "solana.py documentation": https://michaelhly.github.io/solana-py/spl/token/client/.

2038 The ERC-721 token standard is available at Ethereum, "EIP-721: Non-Fungible Token Standard": https://eips.ethereum.org/EIPS/eip-721. Many (but not all) Ethereum-based "NFTs" use the ERC-721 standard for their implementation. The FA2 token standard is available at K Ivanov, "tz1p-12.md": https://eips.ethereum.org/EIPS/eip-721, and can be used to implement both fungible and non-fungible tokens.

expected to be capable of being treated by users as "non-fungible".[2039] "Fungibility" and "Non fungibility" as concepts are intended to indicate the particular use cases or treatments for which certain token standards or implementations are most suitable. Whether such tokens are regarded as being fungible at law, in that they can be treated as consisting of two or more legally interchangeable units for the purposes of satisfying specified delivery or transfer obligations, is a separate question that is context specific.[2040]

3.14 Different protocols and implementations that rely on protocol rules (such as smart contract specifications) therefore use different identification functions. For example, the balance identification function for notional units of ether arises as a function of the operation of the Ethereum protocol rules. In contrast, the balance identification function for ERC-20 tokens and ERC-721 tokens operates at the relevant smart contract level. In the latter case, the smart contract itself is recorded by a state change to the Ethereum virtual machine and that state change must occur in accordance with the rules and operation of the protocol.

3.15 Token balances can be tracked, because the state of the distributed digital ledger or digital structured record tracks data points for contract accounts, as well as for externally-owned accounts (accounts owned by humans).

3.16 The authors of *Mastering Ethereum* describe the process as follows:[2041]

> Whereas ether is transferred by a transaction that has a recipient address as its destination, token transfers occur within the *specific token contract state* and have the token contract as their destination, not the recipient's address. The token contract tracks balances and issues events. In a token transaction, no transaction is actually sent to the recipient of the token. Instead, the recipient's address is added to a map within the token contract itself.

3.17 In this way, the balance identification function of data structures that constitute crypto-tokens operates differently for protocol level–specified notional units of account that use UTXO-based systems or account-based systems and for different token implementations.

3.18 However, what is constant is that the data recorded on the distributed digital ledger or digital structured record have an important identifying function. In each case, they

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[2039] For further detail see @punk6529's Twitter thread which explains NFTs, and argues that very few (if any) things in life are truly "fungible": 6529 (23 October 2021): https://twitter.com/punk6529/status/1451896453065023493.

[2040] For example, two might agree to a marketing services contract where the agreed fee was stipulated as being a specific number of tokens from a particular NFT series (such as any 3 Mutant Apes). In that case, all the NFTs in that series would effectively be rendered "fungible" for the purposes of the contract since they would all be equally capable of being used to settle the relevant payment / transfer obligation. Conversely, many crypto-token custody and custodial exchange service providers routinely utilise blockchain transaction history analytics tools to identify and limit the risk of them receiving or facilitating transactions in tokens associated with criminal activity (eg Elliptic: https://www.elliptic.co/). This process results in tokens intended for use in transactions as interchangeable units (such as Bitcoin, Ether and various ERC20-based issuances) being categorised as either "clean" or "tainted" in the context of the contractual services offered by such intermediaries. They are, therefore, rendered "non-fungible" for those purposes.

[2041] A Antonopoulos and G Wood, *Mastering Ethereum* (2018) p 242.

identify, among other things: "what" crypto-token is available to spend or use at any one time, and the quantity of that crypto-token that is available.

OPERATIVE FUNCTION

3.19 Another important function of a crypto-token is its operative function.

3.20 The principal operative function of a crypto-token is that it uniquely can perform an operation (or an action) such as authenticating a message or transaction within the crypto-token system.[2042] Importantly, a crypto-token is also structured so that the performance of any such operation (or action) can be regulated so as to exclude others from performing that same operation.

3.21 The most obvious example of this operative function is the ability to authenticate a new transaction. In general, this authenticated transaction will be recognised as valid by other participants in the crypto-token system and eventually recorded as a state change to the distributed ledger or structured record of the relevant crypto-token system.[2043]

3.22 In high level terms, this operative function could be viewed as an "ability to transact", or a "power to transact". However, that ability or power is necessarily qualified by the rules and practical realities for determining and effecting changes to the distributed ledger or the structured record of the particular crypto-token system. Nevertheless, in broad terms, a crypto-token could be thought of as "a set of transactional functionalities,"[2044] or as an individuated instance of an ability to transact within the confines of the crypto-token system.

3.23 An important feature of a crypto-token is that it can be associated with another data string (or strings) for the purpose of regulating who can control the crypto-token. In other words, access to the associated data string allows a controller to control (to use, to transact with, to create a digital signature from) the associated crypto-token. Conversely, this associative function also allows a controller to exclude those who do not have access to the associated data string from the use of the crypto-token.

3.24 Because of the technical ways in which a crypto-token is structured, it is also generally possible for a controller to identify themselves as having the abilities described above. In other words, a crypto-token can be constructed such that it can be located[2045] within

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2042 See J Allen, "Cryptoassets in private law" in I Chiu and G Deipenbrock, *Routledge Handbook of Financial Technology and Law* (1st ed 2021) n 14, discussing the use of the term "token": "[In computer science] a 'token' is a programming object that represents the ability to perform an action in a software system. To this extent, 'token' is entirely appropriate".

2043 Subject to the transaction being included in a valid block within the crypto-token system and the subsequent recorded state change becoming probabilistically irreversible. See also Chapter 12 n 1062.

2044 D Fox, "Digital Assets as Transactional Power" (2022) 1 *Journal of International Banking and Financial Law* 3.

2045 We use the term "located" in a broad sense. An address simply specifies an abstract location in mathematical space—a number. See C Warmke, "What is Bitcoin?" (2021) *Inquiry*, p 24: https://doi.org/10.1080/0020174X.2020.1860123. Professor Warmke also notes that in the case of the Bitcoin protocol, bitcoin addresses specify locations in mathematical space that themselves ultimately correspond to locations in geometric space, given the Bitcoin protocol's use of elliptic curve cryptography.

the crypto-token network at any one time. A controller can then identify themselves as having the ability to control (and therefore to transact with, or use),[2046] a particular crypto-token at a particular location.

3.25 For example, the spending conditions attached to a crypto-token might require the application of a digital signature derived from a private key. In that case, the crypto-token would be practically "controllable". This is because only a participant with access to the private key would have the capacity to transact with, or use, the crypto-token.[2047] Equally, the controller would have the capacity to prevent (or make it economically unfeasible) for other participants within the network to transact with, or use, the crypto-token.

UTXO-based systems

3.26 An example of how this "control" operates in practice is that a crypto-token can be "locked" or "encumbered" with a condition that must be met to authenticate a new transaction or message utilising that crypto-token. This is achieved through a locking script which creates a cryptographic encumbrance on the specified value and can only be redeemed by the introduction of a solution to the locking script. A person might choose to spend units of account associated with a certain public key address. To do so, they will compose a transaction. The transaction will be structured to release the "lock", or "encumbrance", condition on the output of the transaction by including an unlocking script containing a signature from a private key related to the public address. In other words: [2048]

[2046] The term "use" in this context means the purposeful dealing with, or enjoyment of, the crypto-token, and so would include amendment, signing, validation by signature, disposition, transfer and the mere holding of the crypto-token. It would also encompass other types of "use", such as using a digital asset within an online game. Another "use" is that a controller might simply sign a message to evidence its control over a particular crypto-token, without effecting a transaction. For example, a controller might sign a message allowing a verification bot to scan a specified public address to confirm whether that address was associated with a certain type of NFT. If the address is associated with that type of NFT, it might be given access to a chatroom for holders of that type of NFT.

[2047] We note that locking conditions attached to crypto-tokens do not invariably require association with a private key. See A Antonopoulos, *Mastering Bitcoin* (2nd ed 2018) pp 132–134:

> A locking script is a spending condition placed on an output: it specifies the condition that must be met to spend the output in the future... An unlocking script is a script that "solves", or satisfies, the conditions placed on an output by a locking script and allows the output to be spent. Unlocking scripts are part of every transaction input. In this book we refer to it as an "unlocking script" to acknowledge the much broader range of locking script requirements, *because not all unlocking scripts must contain signatures*. (emphasis added)
>
> Although most locking scripts refer to a public key hash (essentially, a bitcoin address), thereby requiring proof of ownership to spend the funds the script does not have to be that complex. Any combination of locking and unlocking scripts that results in a TRUE value is valid. The simple arithmetic we used as an example of the scripting language [2 + 3 = 5] is also a valid locking script.…Use part of the arithmetic example script as the locking script: 3 OP_ADD 5 OP_EQUAL which can be satisfied by a transaction containing an input with the unlocking script: 2….Not only is this a valid transaction output locking script, but the resulting UTXO could be spent by anyone with the arithmetic skills to know that the number satisfies the script.

[2048] See Nothingmuch, "Self-Issued Credit, Bitcoin & Ideal Money": https://gist.github.com/nothingmuch/861bb2071ba301471d4aa5cd47c6c7ef#self-issued-credit-bitcoin--ideal-money.

> Bitcoin transactions release some encumberments on some satoshis (the conditions in the previous scripts being unlocked by the inputs) and in exchange can create different encumberments on some of the satoshis on the output side.

3.27 By way of illustration, the Bitcoin protocol allows for a locking script to be used to stipulate what conditions must be fulfilled for a particular notional quantity of bitcoin to be placed at the disposal of another participant.[2049]

3.28 The UKJT Consultation described a standard transaction in accordance with the Bitcoin protocol as follows:[2050]

> In a standard transaction where one party ("P1") aims to place value at the disposal of another participant ("P2"), this will be a requirement for P2 to provide: (i) P2's public key that, when hashed, matches the address embedded by P1 in the locking script (which will be P2's address); and (ii) a signature to prove that P2 knows the private key corresponding to P2's public key. Essentially, the locking script creates a cryptographic encumbrance on the specified value and can only be redeemed by the introduction of a solution to the locking script. This solution will be provided as part of the transaction "input" which P2 uses when it wants to transfer the value associated with this output.

3.29 In this way, UTXO which identifies a particular notional quantity of bitcoin (denominated in satoshis) can be located in accordance with the protocol rules by reference to UTXO and its associated locking script. User interfaces such as block explorers or Web-3 wallets extract information from UTXO to identify the locking script that locks that UTXO to a particular public address. So, the crypto-token will, in general, contain a pointer to the "location" of UTXO at any one time. The data string can be associated with a particular location by specifying that location in the locking script of a transaction.[2051] Control over data required to unlock that locking script (for example, a private key) allows control over the crypto-token itself.

3.30 In other words, it is possible within crypto-token systems to impose a condition that must be satisfied to spend or transact with the relevant crypto-token.[2052] The controller of the crypto-token can activate or unlock the crypto-token's associated spending conditions, in accordance with the rules of the system within which they are recorded.

[2049] UK Jurisdiction Taskforce, *Public consultation: The status of cryptoassets, distributed ledger technology, and smart contracts under English private law* (2019) p 23.

[2050] Above p 23; A Antonopoulos, *Mastering Bitcoin* (2nd Edn) (2017) p 24.

[2051] We note that there are multiple script types which operate in different ways to the pay-to-script–hash locking script. Those scripts can be used to create different levels of control that are required to effect a state change to the relevant distributed digital ledger or digital structured record.

[2052] A Antonopoulos, *Mastering Bitcoin* (2nd ed 2018) ch 5.

Account-based systems

3.31 Account-based systems operate in a similar way, although the associative function of crypto-tokens within those systems is a little less abstract. The UKJT Consultation paper describes the associative function as follows:[2053]

> Account-based distributed digital records are also generally generated by a transaction on the system, however, the data string which represents those [crypto-tokens] (i.e. the data string recorded on the distributed digital ledger or digital structured record) is a data string that represents the entire balance of a user's account. This differs from the UTXO model, where the data string representing UTXO recorded on the distributed digital ledger or digital structured record only appears within a set of transaction data.

3.32 In an account-based system, the "state" of the system tracks addresses representing "accounts"; a digital record comprising, among other things, a "balance".[2054] So the identified quantity of notional units is linked directly with a "location"—an account.

3.33 Furthermore, in a typical account-based system, nothing within the transaction message is required to reference any prior inputs, outputs, or other prior transaction data to be valid. Essentially, all that is required for the transaction to be validated by validator nodes is: (i) for the balance of the sending account to be sufficient to cover the balance being transferred; and (ii) for the signature to be valid. If both are valid, the sending account is debited and the receiving account is credited with the value.[2055][2056]

3.34 To compose a valid transaction, a digital signature is required. The ability to create a digital signature demonstrates that a person has control over the relevant account (and, correspondingly, the identified balance within that account). A digital signature in this sense (1) is a digital data string which is associated with or derived from a particular address through a mathematically verifiable process; and (2) allows for such association with, or derivation from, a particular address, to be verified by other participants in the relevant crypto-token system.

[2053] UK Jurisdiction Taskforce, *Public consultation: The status of cryptoassets, distributed ledger technology, and smart contracts under English private law* (2019) p 28.

[2054] A Antonopoulos, G Wood, *Mastering Ethereum* (2018) p 303. UK Jurisdiction Taskforce, *Public consultation: The status of cryptoassets, distributed ledger technology, and smart contracts under English private law* (2019) p 14. We note that account-based systems often support "contract accounts", which facilitate the creation and deployment of smart contracts. These accounts might include digital records of "smart contract code".

[2055] UK Jurisdiction Taskforce, *Public consultation: The status of cryptoassets, distributed ledger technology, and smart contracts under English private law* (2019) p 29; P Murck, "Ethereum Design Rationale - Accounts and not UTXOs" (2018): https://h2o.law.harvard.edu/text_blocks/30595.

[2056] One additional feature in many account-based models which is designed to protect against "double-spend" is for validator nodes to check the "account nonce" of any sending participant. In most account-based systems, for each new transaction constructed by the accountholder and recorded on the distributed digital ledger, a change in the account nonce will also be recorded on the distributed digital ledger as part of the account record. Where two transactions reference the same account nonce, this may mean that a user is attempting to spend the same data twice, and validating nodes may reject the proposed transaction.

Token implementations

3.35 As discussed above, token specifications such as ERC-20 and ERC-721 utilise an identifying function that is recorded at the smart contract level—a data string that exists within the token contract itself. The token contract tracks balances and issues events. The token is uniquely associated with a specific address which is also tracked within the token contract itself. Token standards such as ERC-20 have been specified and designed to support the issuance of "fungible" tokens—the token contract tracks the balances of tokens that are associated with (or "owned" by) specific addresses. In contrast, different token standards, such as ERC-721, have been specified and designed to support the issuance of "non-fungible" tokens. Instead of tracking balances of tokens, the smart contract tracks the unique token ID and associates that ID with a specific address (or "owner"). The updated contract state itself is recorded by a state change to the state of the underlying distributed digital ledger or the digital structured record and that state change must occur in accordance with the rules of the relevant protocol.

3.36 The control function of these types of tokens is also implemented at the smart contract level. Different token standards use different functions, but most will include some form of data mapping function which maps balances (or specific token IDs) to addresses; a transfer function which allows transfers to be composed; and an approve function, which allows an address to control whether a transfer is approved or not.

3.37 As Andreas Antonopoulos and Dr Gavin Wood note:[2057]

> Tokens are different from ether,[2058] because the Ethereum protocol does not know anything about them. Sending ether is an intrinsic action of the Ethereum platform, but sending or even owning tokens is not.

3.38 Nevertheless, token data recorded within the smart contract state (which itself is recorded by the relevant distributed digital ledger or the digital structured record in accordance with the protocol rules) can still be seen as functional data structures. The digital data string, digital record or digital unit of account which constitutes the token is still recognisable by the crypto-tnetwork, has an identifying function and a control function. A controller of data associated with a specific address has the ability to have transfers of the relevant notional unit or token accepted, validated by participants, and ultimately recorded within the smart contract record.

[2057] A Antonopoulos and G Wood, *Mastering Ethereum* (2018) p 227.

[2058] The Ethereum native notional unit.

Appendix 4: short-form, tentative description of a crypto-token

4.1 Below we set out a short-form, tentative description of a crypto-token which synthesises our longer-form descriptions in Chapter 10.

4.2 The purpose of this description is to help delineate those crypto-tokens that satisfy the criteria described in Chapter 5 from other qualifying data objects.

4.3 We do not intend this description to be either exhaustive or determinative. Nor are we suggesting that this description should be translated to a statutory form. Instead, we use this description as a reference point to inform our use of the term crypto-token in the remaining chapters of this consultation paper. More widely, we intend the description to be a starting point for discussion with respondents and market participants, and we welcome and encourage comments and input on the description. For these purposes, the description has also been uploaded to GitHub at https://github.com/LawCommissionofEnglandandWales/Crypto-token-definition where respondents can comment on the description directly.[2059]

4.4 Our starting point is to assume that any crypto-token to which this description is applied is already capable of satisfying the criteria described in Chapter 5. Put another way, this description should only be applied to crypto-tokens provided that the crypto-token is composed of data represented in an electronic medium, exists independently from persons, exists independently from the legal system and is rivalrous.[2060]

4.5 Other things that do not satisfy the criteria set out in Chapter 5 would therefore not fall within the scope of this description. Examples include digital files, amounts credited to an electronic bank account and an electronic representation of a security or bond (unless in the form of a crypto-token). Indeed, even a non-qualifying crypto-token — a crypto-token that does not exhibit the requisite degree of independence of persons and independence of the legal system, rivalrousness and excludability — would fall outside the scope of this description.

4.6 This description uses the term crypto-token. This term describes only a data structure instantiated within a crypto-token system, such that the particular, individuated instance of a data structure takes on a specific, individual function by virtue of the operation of the socio-technical system in which it exists.[2061] The term crypto-token

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[2059] Indeed, in turn, some of the structuring and terms in this description draw heavily on concepts used in G Shapiro, *Simple Code Deference Agreement* (2020), which was made openly available on GitHub at: https://github.com/lex-node/SCoDA-Simple-Code-Deference-Agreement-/blob/master/DAO Charter with Qualified Code Deference.md.

[2060] As we discuss in Chapter 5, we also expect that most crypto-tokens are likely to be divestible on transfer, although we do not treat this as a gateway criterion.

[2061] We are grateful to Peter Hunn for discussions and comments on this description. We also understand that these and other related concepts and issues will be discussed in a forthcoming paper: P Hunn, "Only Binary? Atoms and Bits as Objects of Property" (2022) (forthcoming).

used in this description therefore intentionally does not consider or encompass any of the ways in which things and other rights external to a crypto-token system might be linked to or associated with the crypto-token itself. We discuss how these links might be constituted and the consequences for this at law in more detail in Chapter 14.

Notes on the description

4.7 The description of crypto-token refers to a particular individuated data structure. That particular, individuated data structure must have certain characteristics and functionality, set out within the sub-paragraphs of the description.[2062] Those characteristics and functionality exist by virtue of the application of the protocol rules of the relevant crypto-token system (which will include cryptographic authentication by computational means). Those characteristics and functionality must also satisfy the indicia described in Chapter 5. Together, this distinguishes a particular, individuated data structure from non-rivalrous and non-excludable information.

4.8 The description recognises that a principal operative function of a crypto-token is that it uniquely can perform an operation (or an action) such as authenticating a message or transaction within the crypto-token system.[2063] Importantly, a crypto-token is also structured so that the performance of any such operation (or action) can be regulated to exclude others from performing that same operation. The most obvious example of this operative function is the ability to authenticate a new transaction. In general, this authenticated transaction will be recognised as valid by other participants in the crypto-token system and eventually will be recorded as a state change (or state changes) to the distributed ledger(s) or structured record(s) of the relevant crypto-token system.[2064] We use the terms state and change of state to refer to the canonical and chronological order of transactional events as recorded within the transaction-based ledger or record of a crypto-token system.[2065]

4.9 The description therefore recognises that a crypto-token is a data object that has both, and is a composite of, technical and social dimensions — crypto-tokens exist as instantiations in actively operated socio-technical systems. In that sense, they can be regarded ultimately as a human or social construct that is used to define and delineate a "state transition" or "state change" power to a structured record that humans treat as socially important. The power allows its controller to authenticate a message to perform an operation in respect of that particular crypto-token. That might include

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2062 Although the definition refers to an individuated data structure, we discuss how fungible crypto-tokens can be held in commingled unallocated accounts or pools on behalf of multiple parties in Chapter 16.

2063 See J Allen, "Cryptoassets in private law" in I Chiu and G Deipenbrock, *Routledge Handbook of Financial Technology and Law* (1st ed 2021), n 14, discussing the use of the term "token": "[In computer science] a 'token' is a programming object that represents the ability to perform an action in a software system. To this extent, 'token' is entirely appropriate".

2064 Subject to the transaction being included in a valid block within the crypto-token system and the subsequent recorded state change becoming probabilistically irreversible. See also Chapter 12 n 1062.

2065 In the Ethereum white paper, Vitalik Buterin refers to Bitcoin as a "state transition system": "From a technical standpoint, the ledger of a cryptocurrency such as Bitcoin can be thought of as a state transition system, where there is a "state" consisting of the ownership status of all existing bitcoins and a "state transition function" that takes a state and a transaction and outputs a new state which is the result". He goes on to describe the state of Ethereum as follows: "In Ethereum, the state is made up of objects called "accounts", with each account having a 20-byte address and state transitions being direct transfers of value and information between accounts": https://ethereum.org/en/whitepaper/#ethereum-state-transition-function.

authenticating an operation to effect a state transition of the distributed ledger or structured record in accordance with the protocol rules. That power is embodied by the functionality given to a specific instance of a crypto-token within a particular crypto-token system.

4.10 The description of crypto-token refers to the data structure being recorded "using *one or* more distributed ledgers or structured records". This is intended to reflect the increasing importance of some "Layer 2" implementations of crypto-tokens. Those implementations might separate the execution, settlement and data availability elements of a crypto-token and record or distribute those elements across different distributed ledgers or structured records (sometimes referred to as "layers"). See also Appendix 5 below.

4.11 The functionality described within limb (2) of the description of crypto-token refers to "at any one time". This reflects the importance of a method (either decentralised or through a centralised participant) of establishing a canonical and chronological order of transactional events in transaction-based ledger or record systems. We do not think that the fact that, in some decentralised systems, certain transactions may take time to be reflected on the relevant distributed ledger or structured record is problematic in this respect. However, when considering Layer 2 implementations of crypto-token systems that utilise payment or state channels, there is the potential for a dislocation between the form of a crypto-token as represented by Layer 2 transactional activity and its settlement as represented by an update to the state of the base layer (Layer 1). The dislocation could be temporary if a particular Layer 2 transaction is subsequently settled on the underlying Layer 1 at a later point in time upon (for example) channel closure, or in a sense, permanent if a transaction is "overwritten" by subsequent transaction activity between channel activity. For this reason, we suggest that the references to "at any one time" and "capable" must be read together to recognise that a crypto-token as represented by Layer 2 transactional activity may not necessarily be coincident in time with its settlement as represented by an update to the state of the Layer 1 base layer.

4.12 The sub-concepts of "Crypto-token System" and "Protocol Rules" are left intentionally broad, so as to capture a wide range of crypto-tokens, including crypto-tokens based on private or permissioned crypto-token systems and crypto-tokens based on public, permissionless systems.

4.13 A user of this description could however use the terms "Crypto-token System" and "Protocol Rules" to identify one or more particular crypto-token systems should they wish to be more specific or to limit the scope of the description. For example, should a user wish to specify the Ethereum network, the sub-concepts of "Crypto-token System" could be updated to "means the Ethereum mainnet (networkID:1, chainID:1)", the sub-concept of "Protocol Rules" could be updated to "means the Official Go Ethereum client available at https://github.com/ethereum/go-ethereum", and an additional sub-concept of "the Ethereum Blockchain" could be added within limb (1) of the description of "Crypto-token", to specify that the relevant blockchain was "the version of the distributed ledger commonly known as "Ethereum" that at least a majority of the nodes running the Protocol Rules recognise as canonical as at that time". A carve-out for any recent or previous forks of the Ethereum blockchain could also be added.

4.14 This description does not distinguish between different "taxonomies" or "uses" of crypto-tokens. For example, it does not distinguish between a crypto-token which is merely used as a record (such as a record of a university degree, or within a land register) and a crypto-token which is used as a medium of exchange for goods and/or services. Nor does it exclude any crypto-tokens which might also be "linked" to other things (including property rights or other rights) external to the crypto-token system. We expect that instances of the following types of crypto-tokens could fall within this description:

(a) protocol-level-defined implementations of crypto-tokens which represent a notional unit of account (such as bitcoin or ether);

(b) smart-contract based implementations of crypto-tokens that are primarily intended to represent and be used as "fungible" tokens (such as issuances based on the Ethereum ERC-20 and Solana SPL token standards); and

(c) smart-contract based implementations of crypto-tokens that are primarily intended to represent and be used as specific, "non-fungible" objects (such as issuances based on the Ethereum ERC-721 and Tezos FA2 token standards).

Crypto-token means a particular, individuated data structure which:

1. is constituted by the Protocol Rules of the Crypto-token System in which it is instantiated using one or more distributed ledgers or structured records; and

2. is recognised by the Protocol Rules of the Crypto-token System in which it is instantiated as, at any one time (including by reference to the state of the distributed ledger(s) or structured record(s) and the Protocol Rules relating to state transitions, if applicable):

    a. capable of being uniquely attached to or associated with a particular Data Address, and

    b. capable of Authentication of an operation in respect of the particular instantiation of the data structure (including, if applicable, an operation to effect a change of state of the distributed ledger or structured record).

In this description the following terms have the following meanings:

Authentication means cryptographic authentication via computational or computing means.

Crypto-token System means the system manifested or realised by the operation of a particular set of Protocol Rules.

Data Address means a unique individuated data structure or a particular set of associated data structures or identifiers (including, but not limited to, an asymmetric cryptographic value) which is/are recognised by the Protocol Rules of the relevant Crypto-token System.

Protocol Rules means software code that specifies or embodies rules or algorithms for:

1. the generation, Authentication, sending and validation of data within the particular Crypto-token System;

2. determining and effecting changes to the distributed ledger or the structured record of the particular Crypto-token System by a process of Authentication such that the state of the relevant distributed ledger or structured record is capable of verification by other participants in the Crypto-token System; and

3. determining and effecting changes to the particular Crypto-token System and/or the Protocol Rules themselves.

Appendix 5: Layer 2 Scaling Solutions

5.1 In the explanatory notes to our proposed short form description of a crypto-token, we make reference to "Layer 2" implementations of crypto-tokens. Layer 2 is a general term used to describe a particular category of networks and technologies designed to improve the scalability and efficiency of various blockchain and distributed ledger protocols.[2066]

5.2 Protocols that prioritise decentralised control and transaction security typically achieve this by limiting their scalability. Scalability is limited in two ways: (i) the time within which a transaction can be regarded as "final" in a practical sense (transaction speed);and (ii) the maximum number of transactions that can be processed by a protocol in any given period of time (transaction throughput).[2067]

5.3 As the user base for accessing applications and markets for crypto-tokens instantiated on public blockchain protocols has grown, the need for effective scaling solutions has increased. Capacity limitations result in high transaction costs and settlement delays, particularly during times of high demand, as well as a poor user experience and reduced functionality.[2068]

LAYER 2 AND OTHER SCALING SOLUTIONS

5.4 There are many different approaches to scaling blockchain networks. Layer 2 solutions are a form of "off chain" scaling that are implemented separately from, and so require no changes to, the protocol rules governing the underlying blockchain network. They are similar in that regard to side-chains, which involve the transfer of transactional activity to a separate blockchain linked via a two-way bridge to the underlying network. Bridges enable crypto-tokens (or more accurately, the value and identity associated with particular crypto-tokens) to be "transferred" between different networks, or different levels or layers of the same network.[2069]

5.5 The key difference between Layer 2 and side chain-based solutions is that the former involve the transmission of certain state change and transaction data back to and are

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[2066] See Appendix 4 paras 4.10 to 4.11.

[2067] The challenge of designing a public blockchain protocol that is secure, decentralised and scalable is often referred to as "The Blockchain Trilemma". Proposed originally by Vitalik Buterin, the Blockchain Trilemma expresses the view that this design process necessarily involves trade-offs such that it is only possible to achieve two out of these three properties at any given time, to the detriment of the third. See the commentary entitled "Why do we need Layer 2?" (website last updated on 8 July2022): https://ethereum.org/en/layer-2/. See also CertiK, "The Blockchain Trilemma: Decentralized, Scalable, and Secure?" (2019): https://medium.com/certik/the-blockchain-trilemma-decentralized-scalable-and-secure-e9d8c41a87b3; and B. Giove "Ethereum vs Cosmos: Who is winning the race to scale crypto?" (2022): https://newsletter.banklesshq.com/p/ethereum-cosmos-monolithic-modular-blockchain.

[2068] For historical data on transaction fees and transaction volumes for the Bitcoin and Ethereum networks see https://ycharts.com/indicators/reports/bitcoin_statistics and https://ycharts.com/indicators/reports/ethereum_statistics respectively.

[2069] For further commentary on bridges see the "Bridges and wrapping protocols" section of Chapter 16: Custody of crypto-tokens.

thereby able to benefit from the transaction security[2070] properties of the underlying network. Both Layer 2 technologies and side chains can be distinguished from on-chain (or "Layer 1") solutions (such as increasing block data sizes or adopting different, more rapid consensus mechanisms), which require changes to the network's protocol rules themselves to support increased transaction speeds and throughput.[2071]

ROLLUPS

5.6 Layer 2 technologies are currently being developed and deployed across multiple blockchain networks and utilise a variety of constructs to achieve scalability. For example, on the Ethereum Network "Rollups" are currently the preferred model for Layer 2 solutions.

5.7 Rollups work by providing a transaction execution environment that is separate from the underlying blockchain network, to which they are connected by a two-way bridge. The resulting transaction data is then compressed and transmitted to the underlying network in batches, resulting in substantially lower fees. The two primary forms of rollups currently in use are optimistic and zero-knowledge. They differ primarily on how transaction data is posted to the underlying network.[2072]

5.8 The transaction execution environment established by rollups involves the instantiation, control, use and disposition of Layer 2-specific crypto-tokens. The characterisation of these crypto-tokens as a matter of private property law can therefore be analysed in the same way as Layer 1 crypto-tokens, although additional consideration may be required to understand the potential legal implications of their connection with and of the bridging arrangements deployed to lock the Layer 1 crypto-tokens that they correspond to.

STATE CHANNELS

5.9 Another form of Layer 2 scaling solution is the state channel. State channels are a mechanism for engaging in interactions which could occur on a blockchain network, but instead are conducted "off chain". They work by "locking up" some portion of blockchain state (for example, an amount of crypto-tokens) into an arrangement that is subject to the joint control of a defined set of participants, such as a multi-signature address or smart contract.

5.10 After the state is locked, channel participants use off chain communications to exchange and sign valid transactions that update the locked state without broadcasting and settling them on the underlying blockchain network (for example, a transfer of a quantity of crypto-tokens between channel participants). Each new update "trumps" or overrides previous updates. These are, in effect, transactions that could be settled on the blockchain network at any time, but are not. When the

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2070 Including its processes and properties that help to achieve settlement functionality and settlement integrity.

2071 For further analysis and examples of the different categories of scaling solutions, see https://ethereum.org/en/developers/docs/scaling/.

2072 For further information about the differences between optimistic and zero knowledge rollups see Finematics, "Rollups - The Ultimate Ethereum Scaling Solution" (2021): https://finematics.com/rollups-explained/.

participants are ready to close the channel they deploy and settle the final updated state to the blockchain network.[2073]

5.11 State channels increase the throughput of public blockchains because they decrease the computational demands on network nodes when processing and storing transactions. They also significantly reduce transaction costs, because instead of paying network fees for each transaction, channel participants only have to pay such fees when they open and close a channel (that is, when locking and unlocking the jointly controlled state).

5.12 State channels also help preserve user privacy since transactions within a channel are only known by the participants in the channel, and only the channel opening and closing transactions will be visible to non-participants on the underlying blockchain network.

5.13 Channel participants can interact on the basis that in-channel transactions provide near instant finality thereby avoiding delays associated in settling transactions on the underlying blockchain network. As soon as all participants sign a state update, as between them the update can be considered final, since any of them can settle it on-chain if required.[2074]

5.14 Furthermore, by making extremely low value transactions (or micropayments) economically viable and capable of being processed at very high frequencies, state channels expand the range of transactional arrangements that can be supported by crypto-tokens. For example, it would be possible to use state channels to implement highly granular payment arrangements among channel participants for video or music streaming services that can charge for and receive payment on a per-minute or even per-second basis.[2075]

5.15 Perhaps the most well-known implementation of state channels is the Lightning Network, a routed bidirectional payment channel network that is being used to scale the payment capacity and capabilities of blockchain protocols such as Bitcoin and Litecoin.[2076]

[2073] To be able to operate in a trustless manner, state channels also need to incorporate safeguards to prevent or disincentivise a participant from fraudulently attempting a unilateral channel closure by reference to an outdated state update. These include providing channel participants with a "dispute window" — a period of time within which the validity of the channel closing transaction can be challenged — as well as a mechanism for penalising a fraudulent participant, such as through the slashing or forfeiture of a deposit or claim. See T Close "Playing the state channel exit game" (2020): https://blog.statechannels.org/state-channel-exit-games/; and "Making Trustless Channels" in A Antonopoulos, *Mastering Bitcoin (2nd Edition)* (2017) pp 289 to 296.

[2074] G Knee, "Do state channels exhibit instant finality?" (2020): https://blog.statechannels.org/instant-finality/.

[2075] A Antonopoulos, "Bitcoin, Lightning and Streaming Money" (presentation at the Bitcoin Wednesday Meetup, Amsterdam, The Netherlands, October 2016): https://www.youtube.com/watch?v=gF_ZQ_eijPs; A Antonopoulos, *Mastering Bitcoin (2nd Edition)* (2017) pp 284, 303.

[2076] A Antonopoulos, *Mastering Bitcoin (2nd Edition)* (2017) pp 297 to 304. See also A Antonopoulos, O Osuntokun, R Pickhardt, *Mastering the Lightning Network* (2021).

5.16 The private property law analysis of state channel balances allocated to or capable of being claimed by individual channel participants is potentially more complex than for crypto-tokens instantiated within a rollup-based execution environment.[2077]

5.17 Depending on the construction of the particular state channel system and its relationship to the underlying network such balances could potentially be characterised in a number of different ways, including the following:

(1) As distinct, identifiable objects of property;

(2) As components of crypto-tokens instantiated across an aggregation of multiple layers of a blockchain network.

(3) As proprietary encumbrances attaching to crypto-tokens instantiated on the underlying blockchain network.

(4) As a personal contractual claim to crypto-tokens instantiated on the underlying blockchain network, effective only as between channel participants for so long as the channel remains open, but not capable of being treated as reflective of entitlements good against the world until settled on the underlying blockchain network.[2078]

[2077] See L Horne, "Counterfactual: Generalized State Channels on Ethereum" (2018). In considering the nature of objects and state changes persisting within open state channels, the author proposes the concept of "counterfactual instantiation", which he explains in the following terms:

> "Counterfactual" means something that could be true, but is not. In state channels, we say "counterfactual X" to describe a case where:
>
> X could happen on chain, but doesn't
>
> Any participant can unilaterally make X happen on-chain
>
> Participants can therefore act as though X has happened on-chain."

[2078] See G Knee, "Do state channels exhibit instant finality?" (2020): https://blog.statechannels.org/instant-finality/), in which the author makes the following observation "It is worth remembering that asset transfer means something slightly different in L[ayer] 2 [state channels]: because consensus about a transaction is achieved only among a fixed (and typically small) set of participants, state updates are only ever meaningful to that set. If I pay a counterparty in a state channel, they cannot yet use that money to pay someone outside the channel, until we unlock. Although we have something like instant finality, we do not have instant liquidity".

Appendix 6: High-level descriptions of cryptoassets (as defined therein) and distributed ledger technology from UKJT public consultation on cryptoassets and smart contracts

6.1 Taken from the UKJT public consultation on cryptoassets and smart contracts and reproduced with permission.

Annex 2
Overview and key features of DLT

1 Introduction

DLT is the general term which refers to technologies designed to maintain digital records which are synchronised between participants in a computer network in such a way that identical digital records are (or are able to be) held locally by each participant (or a subset of the network participants), with specific rules relating to the circumstances in which those digital records can be created, updated and then synchronised between participants.

Two core design aims for most DLT implementations are to create mechanisms whereby the relevant digital records: (i) cannot be duplicated in such a way as to permit them to be re-used (i.e. "double-spent"); and (ii) are capable of exclusive control. Most DLT implementations purport to achieve these core aims through the combination of the rules dictating how digital records are created and updated, and the synchronisation of those digital records between participants.

With the aim of informing the answers to the Legal Statement, in paragraph 2 of this Annex below we offer a description of different aspects of DLT, and in paragraph 3 of this Annex below we seek to draw out certain of the key features of DLT which will be central to any legal analysis.

At the outset of this exercise, we acknowledge its limitations. Quite apart from the challenges presented by terminology and taxonomy, these technologies are constantly evolving and what may be a key feature of many DLT implementations at present may well not be in the near future. It should also be noted that, with technological advances, so too the key features of DLT systems that are of relevance to the legal analysis today, or the manner in which they affect the conclusions of that analysis, may change.[13] Nevertheless, it is considered there is value in at least attempting to describe certain aspects of DLT, in order to inform the Legal Statement.

2 Description of DLT

2.1 Network of participants

DLT systems generally rely on computer networks, where participants connect to other (but not necessarily all other) peers. Other key aspects of DLT are forms of software which make use of this computer network.

Participants in a DLT network take many different forms and participate in the computer network to different degrees. Some participants conduct all functions contemplated by the relevant software, whereas others may perform a far more limited role.

"Nodes" are instances of the specific network software being run. That software allows the relevant computer to process and communicate information to other nodes and network participants. So-called "full" nodes usually each store an entire copy of the distributed ledger, whereas so-called "validator" nodes usually also validate proposals to update recorded data (as to this, see paragraph 3 of this Annex). Certain other participants may only able to send messages to other participants on the network, without storing a local copy of the data or being able to validate updates.

[13] For example, the impact of advances in quantum computing, and their effect on the permanence of cryptoassets, remains to be seen.

On certain DLT implementations, copies of the distributed database may be located all around the world, depending on the whereabouts of the nodes. Many DLT implementations are designed so that there is no limit on the number or location of participants who can act as nodes, meaning the geographical reach of some of these networks is potentially significant.

2.2 Permissionless vs permissioned; public vs private

The population of users that is able to: (i) act as a node on the network; and (ii) access the data recorded on the distributed ledger and contribute to updates of that data, is a key point of differentiation between different DLT models.

At a high level, a "permissionless" DLT implementation is one in which anyone can participate in the network without prior authorisation (i.e. anyone can operate a node on the network). In contrast, in a "permissioned" DLT implementation, prior authorisation is required in order to participate in the network. This prior authorisation may be provided in different ways, for example by all other participants in certain implementations, or, in others, from some form of central authority which has superior credentials to, and certain authority over, other nodes (often referred to as "master nodes").

Where a DLT implementation relies on a form of central authority, it may also be that such central authority has the ultimate say in how data is updated on the distributed ledger. This may be because it is the sole user with the ability to update the distributed ledger, or because it has a unique ability to change or override records which other users have previously validated.

The "permissionless"/"permissioned" distinction also differs from the "public"/"private" distinction. In a "public" DLT implementation, all users can view the records being added to the distributed ledger, whereas in a "private" DLT implementation, sight of the record is restricted by system design to a limited subset of users.[14]

A "public" DLT implementation is often also "permissionless" ("**Public and Permissionless**" models), and a "private" DLT implementation is often also "permissioned" ("**Private and Permissioned**" models).

2.3 The distributed digital records

As alluded to above in paragraph 1 of this Annex, distributed ledgers are digital records which are shared between a network of computers such that each participant (or relevant subset of participants) has (or can access) a complete record of the data.

2.3.1 Data structure

Different DLT implementations structure digital records on a distributed ledger in different ways. A common way in which the digital records are structured is in the form of a "blockchain". In a blockchain, digital records are structured in distinct data container structures known as "blocks", i.e. electronic parcels of data. These blocks form a sequential chain, with each block usually linked to the previous block.[15] In many forms of blockchain, this linking between blocks is achieved cryptographically, as each block will record the "hash" of the digital records within the previous block (or whichever set of

[14] See the Financial Conduct Authority's April 2017 "Discussion Paper on distributed ledger technology" p. 10. https://www.fca.org.uk/publication/discussion/dp17-03.pdf (Accessed May 2019).

[15] We note that in certain blockchains blocks are linked to several different blocks rather than just the block appearing immediately prior to it on the ledger.

blocks the new block is linked to).[16] [17] We explain the process of hashing in greater detail below in paragraph 3 of this Annex.

2.3.2 Transaction ledger vs account ledger

Regardless of how the digital records are structured on a distributed ledger, for most current DLT implementations the digital records which appear on the ledger are records relating either to "transactions" or to "accounts". A DLT implementation with a "transaction" ledger is often structured as an "unspent transaction output" ("**UTXO**") model, whereas a DLT implementation with an "account" ledger is known as conforming to the "account-based" ("**Account-Based**") model. We provide some additional detail below regarding what is recorded on the distributed ledger of a DLT implementation conforming to each of these models.

(i) **UTXO model**

In the UTXO model, what generally appears as the digital record on the distributed ledger is a "transaction" (or group of transactions) that has taken place on the network.[18] In this context, the term "transaction" refers to a digital record which:

(a) indicates the possibility for a specific other party (this party can be conveniently imagined as a "transferee") to create a new digital record upon the satisfaction of certain conditions (usually including a "cryptographic signature" – discussed further below in paragraph 3.2 of this Annex). Broadly speaking, this is referred to as the transaction "output" (or UTXO); and

(b) references the output of a prior transaction and provides the required cryptographic signature in order to create a new digital record. Broadly speaking, this is referred to as the transaction "input".[19]

It should be noted that the total set of outputs (i.e. digital records which indicate the possibility for a given participant to create further digital records upon the satisfaction of certain conditions) is not something which is recorded on the distributed ledger in the UTXO model. For example, in the Bitcoin system (which is an example of a UTXO model), the total balance of "Bitcoin" available for a participant to "spend" is not recorded on the Bitcoin distributed ledger.[20] Rather, the distributed ledger records the transactions that have taken place between users and gives every transaction a unique identifier.

(ii) **Account-Based model**

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[16] One of the data points recorded in the previous block included in this hash will be the hash of the block recorded prior to the previous block; hence the reference to the cryptographic linking of blocks.

[17] Note that the first block (i.e. the genesis block) is not linked to any previous block.

[18] The distributed ledger in a UTXO model will record other data; however, for the purposes of this analysis, the key record is the group of transactions.

[19] Andreas M. Antonopoulos, *Mastering Bitcoin* (2nd Ed.) (2017), p.xxxi.

[20] With a Public and Permissionless implementation of the UTXO model, it is, however, generally possible for anyone to discover the balance of UTXO available at an address of a public key. With Bitcoin, for example, this can be viewed by searching a Bitcoin user interface such as www.homebitcoin.com/easybalance/ (Accessed May 2019).

Similar to the UTXO model, distributed ledgers in Account-Based models also track transactions between users of the network. In the context of an Account-Based system, the term "transaction" has a similar meaning to the meaning it has in the context of a UTXO model, albeit that the data comprising the transaction differs in that it does not reference any prior outputs or transactions. We discuss this in greater detail below in paragraph 5 of Annex 3 (*Cryptoassets*).

The key difference between the two models, however, is that the distributed ledger in an Account-Based model also maintains digital records known as "accounts".[21] An "account" is a digital record comprising, among other things, an "address", an account "nonce" and a "balance".[22] Breaking these components down:

(a) "**Address**". The "address" is a unique sequence of characters which can be used to identify an account in a DLT network. The address is the result of hashing a user's "public key" to compress and shorten the public key.[23] We discuss the concept of "hashing" and "public-private key cryptography" in paragraph 3 of this Annex below.

Note that participants in a UTXO model will also have an address. However, in the UTXO model, a participant's address is recorded on the distributed ledger only as part of a transaction.

(b) **Account** "**nonce**". A "nonce" is a computer science term for a random, unique number which can only be used once. Within an Account-Based model, this number will change following the construction and broadcasting of every transaction from an account.[24] In Ethereum, for example, every account has a publicly viewable nonce, which is increased in increments of one every time that a transaction is recorded on the distributed ledger. Other Account-Based models do not use an "incrementing" nonce, but instead the system generates an entirely random number for each new transaction.

In Account-Based models, the account nonce plays a crucial role in enabling network participants to verify that a transaction does not propose to update the same digital record twice. We discuss this further in paragraph 5.2 of Annex 3 (*Cryptoassets*) below.

(c) "**Balance**". The "balance" is the total set of digital records which indicate the possibility for the account user to create further digital records upon the satisfaction of certain conditions. In Ethereum, for example, the

[21] The Ethereum Homestead documentation summarises the difference between the Ethereum and Bitcoin blockchains as follows: "Whereas the Bitcoin blockchain was purely a list of transactions, Ethereum's basic unit is the account". See: http://www.ethdocs.org/en/latest/ (Accessed May 2019).

[22] We note that Account-Based systems often support "contract accounts", which facilitate the creation and deployment of smart contracts. These accounts will include digital records of "smart contract code", which we discuss in greater detail in Annex 4 (*Smart contracts*). This smart contract code is also something that appears on the distributed ledger in an Account-Based model.

[23] Generally, an address is a hashed version of the public key. See: https://hackernoon.com/a-closer-look-at-ethereum-signatures-5784c14abecc (Accessed May 2019).

[24] Note that the account nonce is a separate concept to the "nonce" used in any proof-of-work algorithm.

balance represents the amount of value (or "Ether") available for a participant to spend. This is another point of contrast with the UTXO model.

When a transaction is verified and synchronised between participants, the distributed ledger will also record a change in the accounts of the participants involved in the transaction.[25] This is discussed in greater detail in paragraph 5 of Annex 3 (*Cryptoassets*).

2.4 Changing the distributed record

Distributed ledgers are intended to be dynamic rather than static. This requires rules governing the creation and modification of the digital records which appear on the ledger.

2.4.1 Creating new digital records

The circumstances in which entirely new digital records can be added to the distributed ledger are a key design feature of almost every DLT implementation. These circumstances are specified within the system protocol that is run by network participants (or relevant subset of network participants) and may vary greatly between different implementations depending on what the system is designed for.

Some systems are set up so that new digital records are created only upon the satisfaction of certain conditions, which any participant may be able to satisfy. In several well-known examples of DLT implementations which structure data in the form of a blockchain, the system is designed such that new digital records are introduced in the first transaction in a block.[26] [27] Depending on the relevant consensus mechanism, this is part of the "reward" which the system awards to the participant (usually referred to as a "miner") who establishes the next valid block in the blockchain. We discuss this process further below in paragraph 3 of this Annex.

Equally, a system may be set up to introduce new digital records upon a payment of some form being made (i.e. a so-called "Initial Coin Offering"). Many are set up so that there is a limit to the total number of new digital records which can be created. Other systems are set up so that new digital records are naturally and consistently created as a function of time; some others at random, depending on the caprices of the system designers.

Some systems are designed so that new digital records are only created when a participant operating a master node authorises their creation. In certain Private and Permissioned DLT implementations, for example, a participant operating a master node may be able to create new distributed records when necessary in order to represent off-ledger assets. As an example, a central securities depository[28] may operate a Private and Permissioned network with the intention of facilitating the clearance of securities. In

[25] Andreas M. Antonopoulos and Gavin Wood, *Mastering Ethereum* (2018), p.110.

[26] See, for example, the Bitcoin Whitepaper: "the first transaction in a block is a special transaction that starts a new coin owned by the creator of the block." See: https://bitcoin.org/bitcoin.pdf (Accessed May 2019), p.4.

[27] In certain UTXO models, this first transaction in a block is called a "coinbase transaction".

[28] A central securities depository is an institution that holds financial instruments, including equities, bonds, money market instruments and mutual funds. It allows ownership of those instruments to be transferred in electronic form through updating electronic records which are often known as "book-entry records". See: https://www.fca.org.uk/markets/central-securities-depositories (Accessed May 2019).

such a network, the central securities depository would need to be able to create distributed records that represent the securities for which it is the registrar. In such instances, the central securities depository would typically operate the master node(s) and prohibit the operators of the other nodes from creating any additional distributed records (or, indeed, from validating any updates to those records).

2.4.2 Updating existing digital records

All DLT implementations have a set of rules for the updating of digital records recorded on the distributed ledger.[29] Broadly speaking, in most DLT implementations the process for updating the distributed ledger comprises five key stages:

(i) the construction of a proposal to update the distributed ledger with a new digital record (i.e. a "transaction message"). In many cases, the proposal will be to update the distributed ledger with a digital record which indicates the possibility for another party (i.e. the "transferee") to create a new digital record (but not introduce new value) if that party can satisfy certain conditions;

(ii) the propagation of that proposal through the relevant network, or to the relevant subset of users within the network (i.e. "broadcasting" the transaction message);

(iii) verification checks by other participants (who have received the proposal) to ensure that the proposal complies with the system's rules;

(iv) the further onward propagation (by the relevant network participants who have validated the proposal) of the proposal to other participants; and

(v) the recording of the updated data on the distributed ledger. This process is driven by a technique used to ensure that the relevant participants agree that the data should be recorded on the distributed ledger, known as a "consensus mechanism". We discuss this in greater detail below in paragraph 3.3 of this Annex.

2.4.3 Removing, reversing or deleting digital records

The ability for participants (or a subset of participants) to override digital records or remove them from the distributed ledger is a feature which may or may not be contemplated in a given DLT implementation. These are features which may assist in certain circumstances, for example, where cryptoassets are stolen or transferred in error. Where the system rules do not contemplate these features, it may be that the only way to remedy an error is to submit a "correcting" transaction (e.g. compel the transferee to re-transfer the digital record to the transferor).

Certain DLT implementations may be more likely to include these features. In certain Private and Permissioned networks, for example, it may be crucial for a master node to have the right to override transactions which fall foul of applicable law.

[29] Technically, when an existing digital record is "updated", a new digital record is created with that updated information. The distinction between this and the "creation" of entirely new digital records (discussed above in paragraph 2.4.1 of this Annex) comes down to whether new "value" is introduced into the system. In this context, "value" is a matter of system design rather than any objective wealth-based concept. New digital records which do not, as a matter of system design, introduce new value into the system can loosely be understood as "updates" to existing digital records, whereas new digital records which do introduce value can loosely be understood as "creations" of entirely new digital records.

3 Outline of key features of DLT

3.1 Authenticity, exclusivity and double-spend

With any "transfer" of valuable data, recipients will need to know that the data is authentic and not counterfeit; that the same data has not been transferred more than once (i.e. "double-spent"); and that such data is exclusively usable or "spendable" by the recipient.

Historically, these challenges have been dealt with in two ways: (i) by using physical certificates with unique identifiers; and (ii) by employing independent third parties to keep a record of the transactions.[30]

Electronic data which does not appear in a physical format is more or less (depending on the way in which it is held) susceptible of being copied. Without an infrastructure designed to protect against this, this is likely to destroy the possibility of a given electronic record having unique qualities, i.e. the scarcity of that digital record. It is also likely to mean that an individual cannot credibly claim to have exclusive control of that electronic record.

As discussed above, DLT systems are designed to offer solutions to these issues. Different DLT implementations attempt to solve these problems in different ways. However, at a high level, most use a combination of the following:

(i) a network validation or verification process, in which participants (or a subset of participants) check that a proposed change to the ledger complies with the system rules. This will usually involve checking:

  (a) that a proposal to update a given digital record comes from an individual who is, as a matter of system design, entitled to propose that update (i.e. to ensure "exclusivity"); and

  (b) that a proposal to update the same digital record has not already been made or recorded on the distributed ledger (i.e. to ensure no "double-spend"); and

(ii) the agreement among participants (or a subset of participants) that certain proposed changes (which have been verified) are then maintained on the distributed ledger.

We discuss each of these features below.

3.2 Validation process

3.2.1 Exclusivity

Different DLT implementations deal with exclusivity in different ways. For example, in the context of financial markets, a central securities depository may run a Private and Permissioned network for securities clearance and, while its clearing members may operate nodes on that network, the central securities depository's master node may want to preserve additional rights for itself (or its regulators) to validate transactions. In such systems, the central securities depository may be able to ensure exclusivity by acting as a trusted third party.

[30] Sarah Green, "Cryptocurrencies: The Underlying Technology", *Cryptocurrencies in Public and Private Law*, edited by David Fox and Sarah Green (2019), p.2.

However, many DLT implementations attempt to achieve exclusivity by utilising public-private key cryptography. At a high level, public-private key (or "asymmetric"[31]) cryptography involves a party (who we can imagine as the "transferor") encrypting that data in such a way that only another party (who we can imagine as the "transferee") who has access to something or information which can decrypt the data is able to decrypt it.

This process relies on "hashing" certain data inputs. At a high level, "hashing" is the function that transforms input data into a unique, fixed-length data string (known as the "hash") which, practically speaking,[32] is impossible to reverse to produce the inputs.[33] An illustration of how this works is provided below by reference to the well-known "Secure Hash Algorithm 256" ("**SHA256**") hash algorithm which, when applied to the sequence of letters "abc", has the following SHA256 hash (expressed in hexadecimal[34]):

ba7816bf-8f01cfea-414140de-5dae2223-b00361a3-96177a9c-b410ff61-f20015ad.[35]

This hash can be used as a unique identifier of the above text as: (i) if any punctuation or word were changed, a different hash would result; and (ii) in relation to the SHA256 hash algorithm, it is practically impossible to find another text that results in exactly the same hash.[36]

The transaction message created by a transferor will include a locking script which can only be satisfied by the transferee hashing their "private" key with certain other data to form a signature.

A private key is a string of data that is generated based on a random number (known as a "seed"). It is part of a participant's "public-private key" pairing, the other part being the participant's unique "public" key, with the "public" key being the hash of the private key. For a given DLT implementation, certain software enables participants to generate these key pairs.[37]

The locking script works by identifying within it the transferee's public key. The public key is usually freely viewable for any participant in the relevant network. However, due to the hashing process, practically speaking, it is not possible to derive the private key from the public key.

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[31] It is referred to as "asymmetric" as the key that is used to encrypt the relevant data is different from the key used to decrypt it. See Imran Bashir, *Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained, 2nd Edition* (2018), p.81.

[32] We understand it is theoretically possible to discover the inputs to which the hashing algorithm has been applied. Were it to become easier to do this, there is a question as to whether any legal analysis would need to change to reflect this.

[33] See the EU Blockchain Observatory report, p.28. The report is accessible here: https://www.eublockchainforum.eu/sites/default/files/reports/report_scalaibility_06_03_2019.pdf (Accessed May 2019).

[34] Hexadecimal (or hex) is a system which uses 16 digits (being 0 1 2 3 4 5 6 7 8 9 A B C D E F) in order to represent binary sequences. Each hex digit reflects a 4-bit binary sequence.

[35] See: https://www.movable-type.co.uk/scripts/sha256.html (Accessed May 2019).

[36] Sarah Green, "Cryptocurrencies: The Underlying Technology", *Cryptocurrencies in Public and Private Law*, edited by David Fox and Sarah Green (2019), p.3.

[37] In the context of many DLT implementations, a user typically gains access to a public/private key pairing through a "wallet". A "wallet" refers to the software that allows users to generate master public-private key pairs from a seed number. This software can be used offline (i.e. without a connection to the associated DLT network). The term "wallet" is also, however, used to refer to an online application which displays all coin addresses (or public keys) of a user, and to provide this information accurately, the wallet needs to be online or connected to a blockchain file, which it uses as its source of information.

It is, however, easy to verify that a signature can only have been provided by someone with knowledge of the private key linked to the public key. Consequently, in DLT implementations which use public-private key cryptography, validating participants will need to check that a proposal from a participant to update the distributed ledger used the appropriate private key.

3.2.2 Double-spend

In addition to checking that a proposal to change the distributed ledger is made by an individual entitled to do so, validators must also check that this same proposal has not already been made.

The checks which are carried out for this purpose are very specific to the DLT implementation. We discuss these further below in the context of the UTXO model and the Account-Based model in paragraphs 4.3 and 5.2 of Annex 3 (*Cryptoassets*).

3.3 Synchronising the distributed record

All DLT implementations use a technique to ensure there is agreement between participants (or a relevant subset of participants) as to what digital records are maintained as part of the distributed ledger. This technique is often referred to as a "consensus mechanism". It is the consensus mechanism which determines whether a validated proposal to update a digital record (i.e. one which participants (or a relevant subset of participants) have verified as complying with the system's rules) forms part of the distributed ledger.

Many of the Public and Permissionless implementations rely on majorities of participants to agree on what is recorded on the distributed ledger. In such circumstances, if any participants alter or modify the content of any given record once it is recorded, it would also have to compete to persuade all nodes that the new content is correct.[38] It may be possible to do this, for example, if an individual has sufficient control over a majority (i.e. greater than 50%) of the nodes in the network – this is what is referred to as a 51% attack.[39] However, the larger the network the more difficult (and expensive) this becomes. Of course, this may be easier to achieve depending on the majority threshold required for the validation and distribution of new records.

There are a range of different consensus mechanisms. Two well-known examples are:[40]

(i) "**Proof of work**". This relies on a user proving that adequate computational resource has been spent before a record of transactions can be accepted as part of the distributed ledger. This function is performed by "miners", who are network participants who compete to establish new distributed records.[41]

In the context of many blockchain implementations which rely on proof of work as the consensus mechanism, once a transaction is verified as conforming to the system rules, it is included in a proposed block by a node for "mining" (although at this stage it remains

[38] Sarah Green, "Cryptocurrencies: The Underlying Technology", *Cryptocurrencies in Public and Private Law*, edited by David Fox and Sarah Green (2019), p.4.

[39] Where a DLT implementation relies on a trusted central authority or master node to assist with securing the integrity of data that is recorded, it may have less need to rely on this form of cryptographic linking between blocks, as the central authority may itself maintain the integrity of the ledger by acting as the sole party entitled to update it.

[40] Note that the mechanism by which consensus is reached varies depending on the particular implementation and is unspecific to whether it follows the UTXO model or the Account-Based model.

[41] In most DLT systems, all miners will also be nodes, but not all nodes will be miners.

an “unconfirmed transaction”). “Mining” is the process by which blocks are added to the blockchain. The block is validated by a miner performing a “proof of work” computational puzzle. The puzzle is intended to require many computational steps without shortcuts.[42] Once the puzzle is solved, the successful miner can broadcast the block with the puzzle solution in it and it is very easily verified by other nodes (who may or may not be miners) on the network. Once verified by the majority of nodes, the block is added to the blockchain.

(ii) “**Proof of stake**”. This relies on a user proving that it has a stake in the system that is sufficient to prevent it from acting in a malicious/fraudulent manner. Users competing to establish new blocks must construct a particular type of transaction which locks up their balance as a form of “deposit”. Validators then take turns proposing and voting on the next valid block, and the weight of each vote depends on the size of the validator’s deposit, with each validator shouldering the risk that they lose their deposit if the block they vote on is rejected by the majority of validators.[43]

In the context of many Private and Permissioned networks, as restrictions are placed on the population of entities who may operate nodes, a consensus mechanism dependent upon a majority of nodes may be less important. Further, where such networks include one or more master node(s), the master node(s) may act as the final and absolute truth for the network rather than relying on other nodes to establish consensus on what is recorded on the ledger.

3.4 Summary

Most DLT implementations attempt to ensure that certain digital records cannot be copied and can only be modified by someone entitled to modify them. In many implementations, public-private key cryptography enables an individual to provide evidence of an entitlement to modify the relevant data, and it also excludes anyone other than the participant who has knowledge of the relevant private key from being able to modify further the relevant data. The consensus mechanism and distributed nature of the database can prevent double-spend, as any attempt to spend the same data twice would not achieve the consensus necessary for validation and recording.

The Bitcoin Whitepaper sums up the combined effect of the different technologies as follows:

> *We have proposed a system for electronic transactions without relying on trust. We started with the usual framework of coins made from digital signatures, which provides strong control of ownership, but is incomplete without a way to prevent double-spending. To solve this, we proposed a peer-to-peer network using proof-of-work to record a public history of transactions that quickly becomes computationally impractical for an attacker to change if honest nodes control a majority of CPU power.*[44]

[42] Anthony Lewis (1 September 2015), “A Gentle Introduction to Bitcoin”, See: https://bitsonblocks.net/2015/09/01/a-gentle-introduction-to-bitcoin/ (Accessed May 2019).

[43] Andreas M. Antonopoulos and Gavin Wood, *Mastering Ethereum* (2018), p.321.

[44] See: https://bitcoin.org/bitcoin.pdf (Accessed May 2019), p.8.

Annex 3
Cryptoassets

1 Introduction

Cryptoassets are no longer merely a technological concept. Increasingly, they are entering the consciousnesses of governments, regulators, bankers, accountants, lawyers and academics.

Many regulatory authorities have assessed, from a regulatory perspective, various types of cryptoassets (and services related to them) for their respective jurisdictions, which has required such authorities to attempt to define what they are.[45]

However, for the purposes of English private law, there is no general definition of a cryptoasset, and the UKJT recognises that there may exist a great deal of uncertainty as to what is meant, or what is being described, when the term is used.

We do not seek to address the semantic uncertainties of the term "cryptoasset" in this consultation paper by advancing a legal definition of the term. However, for the purposes of informing the answers to be provided in the Legal Statement, we set out below high-level descriptions of certain of the key technical features of technologies which are commonly understood to support cryptoassets.

2 Technical features

Broadly speaking, the term "cryptoasset" is often used to describe something which is, or of which at least a component is, represented by certain data (often, although not necessarily, recorded on a distributed ledger) which, by virtue of the design of a broader system, can only be updated upon the satisfaction of specific conditions. As discussed in paragraph 3 of Annex 2 (*Overview and key features of DLT*), these conditions usually involve: (i) public-private key cryptography to evidence the authenticity of the participant proposing the update; and (ii) a mechanism to ensure the same data has not been copied or updated (i.e. "spent") twice.

As noted in paragraph 2.3 of Annex 2 (*Overview and key features of DLT*), there are two broad categories of DLT implementation: the UTXO model and the Account-Based model. Broadly, all DLT implementations will conform to one of these models, and both models can support either a Public and Permissionless network or a Private and Permissioned network. We provide further descriptions of the data that is stored, and how it is updated, in both models below in paragraphs 4 and 5 of this Annex.

Consequently, from a technical perspective, despite different DLT networks being designed for different purposes, the distributed records that appear in both which are commonly understood to comprise (whether in whole or in part) cryptoassets may share substantially similar technical features. We illustrate this below in paragraph 3 of this Annex.

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[45] The Cryptoassets Taskforce (comprising HM Treasury, the Financial Conduct Authority and the Bank of England), for example, has advanced a broad definition of a cryptoasset as a type of "cryptographically secured digital representation of value or contractual rights that uses some type of DLT and can be transferred, stored or traded electronically". See paragraph 2.10 of the Cryptoassets Taskforce: final report (October 2018). See: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/752070/cryptoassets_taskforce_final_report_final_web.pdf (Accessed May 2019). Many regulators have gone on to draw a distinction between different types of cryptoassets, being "exchange tokens", "security tokens" and "utility tokens". See also the Financial Conduct Authority's consultation on the regulatory characterisation and treatment of cryptoassets (accessible here: https://www.fca.org.uk/publication/consultation/cp19-03.pdf (Accessed May 2019)).

3 Types of cryptoasset and other distributed records

The current most common purpose of DLT implementations is to facilitate an electronic means of exchange between different participants on the same network (a so-called “exchange token”). In such implementations, the data referred to as the “cryptoasset” does not provide any rights to anything outside of the “network”. Bitcoin and Ether are examples of this type of cryptoasset.

However, the data infrastructure used within a system designed to facilitate “exchange tokens” can also be used as a means to facilitate the representation of legally enforceable rights of a participant. For example, systems may be set up where certain distributed digital records are intended to represent: (i) ownership of an off-ledger, real-world asset, such as a commodity; (ii) an entitlement to repayment of a specific sum of money; or (iii) an entitlement to a share in future profits of a company or project. The latter two examples are often referred to, in the context of financial services regulation, as "security tokens".[46] With such a use case, a separate mechanism is required in order to link the distributed digital record with the rights that distributed digital record purportedly represents. For example, where a DLT system is designed with the purpose of representing a bond in so-called “token” format, a separate legal document containing the covenant of the bond issuer to pay the “holder” of the cryptoasset would be required and would need to specify, for example, that the person or entity who has knowledge of the relevant private key corresponding to the DLT record is entitled to payment from the bond issuer, or otherwise define how the “holder” may be identified and assert its payment entitlement.[47]

In such use cases, what is meant by the term “cryptoasset” may be less clear. The term is often used to refer to the combination of the distributed digital record and the legally enforceable rights (created separately) which that distributed digital record is intended to represent.[48] However, the distributed digital records themselves (quite apart from the separately created enforceable legal rights) may share substantially similar technical features to the distributed digital records that appear in the context of an “exchange token”.[49]

Consequently, any analysis of the legal status of “cryptoassets” should involve a consideration of these distributed digital records separately to the rights purportedly represented by them.

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[46] The Financial Conduct Authority (“**FCA**”) defines “security tokens” as those cryptoassets that meet the definition of a “specified investment” as set out in the Financial Services and Markets Act 2000 (Regulated Activities) Order 2001, and possibly also a “financial instrument” under Directive 2014/65/EU (MiFID II). For example, these cryptoassets have characteristics which mean they are the same as or akin to traditional instruments such as shares, debentures or units in a collective investment scheme. Security tokens are the type of cryptoasset which falls within the FCA’s regulatory perimeter. For further details please see the FCA’s Guidance on Cryptoassets, CP19/03, accessible at: https://www.fca.org.uk/publication/consultation/cp19-03.pdf (Accessed May 2019).

[47] As Private and Permissioned networks provide participants with greater levels of control over who participates, how cryptoassets come into existence and how they are transferred, Private and Permissioned DLT implementations are often seen as being more suitable for the development of a “security token” structure. However, in theory, it is certainly possible for a cryptoasset in a Public and Permissionless network to amount to a “security token”, for example, if a separate legal mechanism provides that ownership of a cryptoasset in such network entitles the participant who knows the relevant private key to a payment, or otherwise defines how the “holder” may be identified and assert its entitlement.

[48] See, for example, the reference to “security tokens” in paragraph 2.11 of the Cryptoassets Taskforce: final report (October 2018). See: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/752070/cryptoassets_taskforce_final_report_final_web.pdf (Accessed May 2019).

[49] We note that several well-known DLT implementations are commonly thought of as not relying on “native” cryptoassets as part of the consensus mechanism, unlike Bitcoin or Ethereum. However, as these DLT implementations utilise either the UTXO model or the Account-Based model, the data recorded on the distributed shares similar features to that recorded on the distributed ledger in DLT implementations which do rely on “native cryptoassets”. An example of this is R3’s Corda, which utilises the UTXO model, but is not commonly thought of as relying on a “native” cryptoasset.

Given the similarities with respect to what appears on the distributed ledger, it may be that the legal analysis with respect to the distributed digital records utilised in a "security token" structure is the same as the legal analysis for the distributed digital records utilised in an "exchange token" structure.

The same point can be made with respect to DLT implementations where similar distributed digital records are intended to be used to:

(i) evidence (rather than constitute) a participant's title to an off-ledger, real-world asset. For example, some financial institutions may operate a DLT network (likely a Private and Permissioned network) for use as their books and records to record transactions and account positions; or

(ii) confer on participants the right to access a specific product or service that is provided on the DLT network or outside it (i.e. so-called "utility tokens"[50]).

4 Cryptoassets (or distributed records) in the UTXO model

In the case of certain cryptoassets, what is really being referred to is an "unspent transaction output" or "UTXO". Below, we draw on the explanations provided above in Annex 2 (*Overview and key features of DLT*) and elaborate on them in the context of UTXOs.

4.1 Representation as an "output" within a transaction

A UTXO is represented by a unique string of data, manifested as a readable sequence of characters.[51] It is viewable as a data entry, along with several other related data entries, within the digital record comprising a "transaction" appearing on the distributed ledger. It is usually identified in the "output" field within a transaction record.

Typically, the output field will contain the following sub-fields:

(i) **Value**. This is the numerical value which, as a result of the transaction, is being placed at the disposal of whoever knows the private key associated with the public recipient address. It is important to note that, in constructing a transaction message, the constructor could theoretically put whatever value they so desired; at the stage of transaction message construction, the value is not constrained by the values of UTXO already available for the message constructor to spend. The constraint on this is imposed by the other participants in the network who, in conducting the transaction validation check, would reject the proposed transaction as invalid on the grounds that the "outputs" do not have any previous associated "input" (see paragraph 4.3 of this Annex below). This rejection will necessarily happen as a result of the system protocol.

(ii) **Locking script**.[52] This is a script which stipulates what conditions must be fulfilled for that value to be placed at the disposal of another participant.

In a standard transaction where one party ("**P1**") aims to place value at the disposal of another participant ("**P2**"), this will be a requirement for P2 to provide: (i) P2's public key

[50] See paragraph 2.11 of the Cryptoassets Taskforce: final report (October 2018). See: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/752070/cryptoassets_taskforce_final_report_final_web.pdf (Accessed May 2019).

[51] David Fox, "Cryptocurrencies in the Common Law of Property", *Cryptocurrencies in Public and Private Law*, edited by David Fox and Sarah Green (2019), p.143.

[52] In the Bitcoin system, this is referred to as "*scriptPubKey*".

that, when hashed, matches the address embedded by P1 in the locking script (which will be P2's address); and (ii) a signature to prove that P2 knows the private key corresponding to P2's public key. Essentially, the locking script creates a cryptographic encumbrance on the specified value and can only be redeemed by the introduction of a solution to the locking script.[53] This solution will be provided as part of the transaction "input" which P2 uses when it wants to transfer the value associated with this output (see paragraph 4.2 of this Annex below).

It is important to note that each transaction recorded on a UTXO distributed ledger contains UTXO represented by a unique string of data. As this string of data is unique, technically speaking a "new" UTXO is created by each transaction, albeit that the transaction may not bring new "value" into the system.[54]

4.2 UTXO "consumed" as an input

In paragraph 4.1 of this Annex above, we outlined how UTXOs are represented as outputs within transaction data recorded on a distributed ledger. However, for a transaction to be valid in the UTXO model, it must also include "inputs".[55] Inputs are essentially "to-be-consumed outputs".

To illustrate this, it may be helpful to assume that a valid transfer of UTXOs has taken place between Alice and Bob, who are two participants in a UTXO system, such that those UTXOs are available for Bob (or whoever knows Bob's private key) to spend. If Bob wishes to "spend" those UTXOs by transferring them to another participant, Carol, he will need to construct a transaction message which contains inputs which reference those UTXOs. This will involve Bob constructing an input consisting of:

(i) **a transaction identifier**. This is a data entry which is used to refer to a particular output, which consists of:

  (a) **a transaction identification number ("TIN")**. This is used to uniquely identify the particular transaction that led to the creation of this input, i.e. the original transaction from Alice to Bob; and

  (b) **an output identification number ("OIN")**. This is an "index" which identifies the specific output which was transferred from Alice to Bob and which is to be consumed in the transaction being assembled by Bob (i.e. this identifies a particular output (or set of outputs) to be spent in Bob's transfer to Carol); and

(ii) **a signature script**. This is the computational script for satisfying the conditions stipulated by the locking script set by Alice when she made the original transfer to Bob, i.e. the conditions which enable Bob to consume the previous outputs as inputs for his transfer to Carol. As noted in paragraph 4.1(b) of this Annex above, in a standard transaction, to satisfy the conditions set by Alice in the locking script, Bob's signature script will be required to contain:

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[53] Andreas M. Antonopoulos, *Mastering Bitcoin* (2nd Edn) (2017), p.24.

[54] We refer to paragraph 2.4 of Annex 2 (*Overview and key features of DLT*) and, in particular, footnote 29, where we draw this distinction.

[55] Transaction messages must also include certain other data. However, for the purposes of this consultation paper, we have not set out a detailed explanation of this additional data.

(a) Bob's public key which, when hashed, matches the address embedded in the locking script set by Alice; and

(b) a signature to prove Bob's knowledge of the private key corresponding to that public key. This will appear as a hash of Bob's private key and certain data from the transaction between Alice and Bob. Essentially, Bob uses his private key to encrypt certain transaction data, and that transaction data can be decrypted using Bob's public key. This allows anyone to check that Bob did indeed have knowledge of the private key, which is a key part of the transaction verification process.[56]

For Bob's transaction to Carol to be validated by nodes on the UTXO network, in addition to the input data entry, he will need to include an output data entry containing the data set out in paragraph 4.1 of this Annex above, i.e. a "value" to be transferred to Carol and a locking script to determine how Carol is able to spend that value.

4.3 Transaction validation

As noted in paragraph 3.2 of Annex 2 (*Overview and key features of DLT*), the transaction validation feature is designed to help to provide participants with a degree of exclusivity in relation to UTXOs and prevent them from being "double-spent". In most UTXO models, the transaction validation exercise will involve checking that (among other things):

(i) every transaction must prove that the sum of its inputs is greater than the sum of its outputs;

(ii) every referenced input must be valid and not yet spent; and

(iii) for every input, the transaction must have a signature which proves that the transferor has knowledge of the private key corresponding to the public key referenced in the relevant locking script for the outputs consumed by this input (this is the "signature script" which we discussed above in paragraph 4.2 of this Annex).

Note that no verification is made as to whether the total amount of UTXO available for a user to spend is greater than (or at least equal to) the amount proposed to be transferred in the transaction (i.e. no "account" balances are checked).

As discussed above, the population of participants who conduct this validation exercise may differ significantly between different DLT implementations, depending on what purpose the network is designed for. In certain Private and Permissioned models, recipients may be required positively to "accept" transactions and, in some models, the operator of the master node may also have the right to decline any transaction or reverse a transaction previously validated and recorded on the distributed ledger.

4.4 Transactions involving multiple inputs and outputs

The summaries above in paragraphs 4.1 and 4.2 of this Annex assume a chain of two transactions (i.e. from Alice to Bob and then Bob to Carol) which each purport to transfer the same value and, each time, only to one recipient address. However, in practice, transactions will

[56] The following description provided in the Bitcoin Whitepaper is helpful in illustrating this: "*We define an electronic coin as a chain of digital signatures. Each owner transfers the coin to the next by digitally signing a hash of the previous transaction and the public key of the next owner and adding these to the end of the coin. A payee can verify the signatures to verify the chain of ownership.*" See: https://bitcoin.org/bitcoin.pdf (Accessed May 2019), p.2.

often involve: (i) outputs from several different transactions; (ii) outputs being sent from more than one address of a user; (iii) outputs being sent to different recipients, each with a different address; and (iv) the transfer of only a portion of the value of a spendable output. We discuss these further below.

4.4.1 Outputs from several different transactions, referencing the same public address

Here, Alice wants to transfer UTXOs with a value of 10 to Bob from one public address. Alice's public address is referenced by two separate UTXOs with a combined value of 10, which have been received as a result of two separate prior transactions with each UTXO with a value of 5. However, Alice wants to send the two separate UTXOs with a combined value of 10 in one single transaction.

In constructing her transaction message, the "input" will consume both separate UTXOs. As a result, the transaction identifier for her transaction will include the TINs and OINs for both prior transactions. Assuming both outputs to be spent reference the same public address of Alice, Alice will be able to satisfy each associated locking script using the same private key associated with her public address. The output entry (being the new UTXO) which Alice creates will specify a value of 10 and a locking script which sets the conditions to be satisfied by Bob, referencing Bob's public address.

Once the transaction is verified and subsequently recorded in a block, Bob will be able to spend a single UTXO with a value of 10. Any transaction he constructs to transfer that UTXO will only need to reference the one TIN of the transaction from Alice to Bob, and the OIN of that same transaction, which identifies the one UTXO with a value of 10 included in the transaction.

4.4.2 Outputs from several different transactions, referencing different public addresses

Here, Alice wants to send UTXO with a combined value of 10 to one public address of Bob, however she has two separate UTXOs, each with a value of five and each of which references a different public address of Alice. Alice will need to construct two transaction messages and satisfy the two locking scripts using two separate private keys. Each transaction will have to specify outputs with a value of five, and the locking script used in both would reference Bob's public address.

Once the two transactions are verified and subsequently recorded in a block, Bob will be able to spend the transferred output value of 10. Any transaction Bob constructs to transfer those outputs to Carol will need to include an input referencing both TINs of the transactions from Alice to Bob, and the OINs of the outputs (with a value of five each) of both of those transactions.

If Carol wants to transfer those UTXO with a value of 10 on to another third party, any transaction she constructs will just need to include an input which references the one TIN of the transaction from Bob to Carol, and the one OIN of the output (with a value of 10) of that transaction.[57]

[57] It is important to note that what appears on the distributed ledger is not what appears in a user's "coin" wallet. Most wallet software gives the impression that "coins" are sent from and to wallets, but really it is outputs and inputs moving from transaction to transaction. When a user's wallet records a balance of 100 "coins", what this really means in the UTXO model is that the user is able to spend unspent transaction outputs with a total value equal to 100.

4.4.3 Outputs from one transaction, only a portion of which is transferred

Here, Alice wants to send UTXO with a value of five to Bob. However, Alice has a single UTXO with a value of 10 (which was transferred to her as a single UTXO (with a value of 10) in one transaction and references one of Alice's public addresses). In the UTXO model, when a user transfers the unspent value from their address, every unspent output at that address which was received in the same transaction has to be retrieved, the amount to be transferred deducted, and then the remaining balance returned to a "change" address (i.e. a new address) of the transferor.[58] [59] The reasoning behind this is that each output from one transaction can only ever be referenced once by an input of a subsequent transaction. The return of the change balance to a "change" address is facilitated by the construction of another transaction which makes those excess outputs available for the transferor to spend using their private key.[60]

The process has been summarised as follows:

> *If a user wants to send a transaction sending X coins to a particular address, it may sometimes be the case that some subset of their UTXOs has a combined denomination of exactly X, in which case they can create a transaction that consumes those UTXOs and creates a new UTXO of value X owned by the destination address. When no such perfect match is possible, the user must include input UTXOs with a combined denomination greater than X, and add a second destination UTXO called a "change output" that assigns the excess coins to an address controlled by themselves.*[61]

Consequently, in order to effect the transfer described above, Alice must construct a transaction which consumes the entire UTXO with a value of 10, split between two separate outputs with two separate locking scripts on the outputs, each with an associated value of five. One locking script will be satisfiable by Bob's private key, and the other by Alice using her private key. The "change" address does not have to be the same address as that of the input (but it is likely to be).[62]

4.4.4 Outputs from one transaction, transferred to two different public addresses

This is essentially the same logic as that outlined in paragraph 4.4.3 of this Annex above, except that the two locking scripts will reference the two public addresses of the transferees, rather than one referencing Alice's "change" address.

4.4.5 Mixing outputs

In certain implementations, where a transaction makes a value available for a transferee to spend which is a combination of two separate outputs, once the transferee transfers

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[58] With a portion of the transferred output going to miners in the form of unspent outputs (i.e. a "transaction fee").

[59] The Bitcoin Whitepaper summarises this process as follows: "*Although it would be possible to handle coins individually, it would be unwieldy to make a separate transaction for every cent in a transfer. To allow value to be split and combined, transactions contain multiple inputs and outputs. Normally, there will be either a single input from a larger previous transaction or multiple inputs combining smaller amounts, and at most two outputs: one for the payment, and one returning the change, if any, back to the sender.*" See: https://bitcoin.org/bitcoin.pdf (Accessed May 2019), p.5.

[60] See: https://hackernoon.com/why-ethereum-when-we-already-have-bitcoins-blockchain-3359eb7e087e (Accessed May 2019).

[61] See: https://medium.com/@ConsenSys/thoughts-on-utxo-by-vitalik-buterin-2bb782c67e53 (Accessed May 2019).

[62] Most wallet software will usually use the same address as that of the input automatically.

that value to another user by referencing those outputs within an input and creating one combined output, it is likely to be impossible to determine which original transaction any subset of that transferred value originated from. However, we note that this may vary between implementations.

4.5 How do "new UTXOs"[63] come into existence?

As discussed in paragraph 2.4.1 of Annex 2 (*Overview and key features of DLT*), the circumstances in which new digital records (and, in the context of the UTXO model, new UTXOs) come into existence vary extensively between different implementations.

In every case, however, the introduction of value requires a transaction which includes a combination of "inputs" and "outputs", similar to any other UTXO transaction. What distinguishes this type of transaction from any other type is that it does not "consume" UTXO as inputs. Rather, it has only one input, and this input will not contain a reference to a prior output. This first transaction will, however, have an output (although only one), which will identify the recipient's public address in the locking script (meaning only the owner of the private key associated with that address is able to spend the value).

5 Cryptoassets (or distributed records) in the Account-Based model

In the case of certain cryptoassets, what is really being referred to is the "balance" or "value" recorded within an "account" that is available to whoever knows the private key associated with that account to "spend" by constructing a transaction message. Again, we draw on the explanations provided in Annex 2 (*Overview and key features of DLT*) and elaborate on them in the context of cryptoassets in the Account-Based model.

5.1 How are cryptoassets in the Account-Based model represented?

Much of the general description provided above in relation to UTXOs applies equally with respect to cryptoassets in the context of the Account-Based model. Like UTXOs, Account-Based cryptoassets are represented by a string of data, manifested as a readable sequence of characters.

Account-based distributed digital records are also generally generated by a transaction on the system, however, the data string which represents those cryptoassets (i.e. the data string recorded on the distributed ledger) is a data string that represents the entire balance of a user's account. This differs from the UTXO model, where the data string representing UTXO recorded on the distributed ledger only appears within a set of transaction data. This distinction goes to the heart of the difference between the UTXO model and the Account-Based model, which we discussed in paragraph 2.3.2 of Annex 2 (*Overview and key features of DLT*).

5.2 Transactions

Many of the core components required for constructing and effecting transactions are similar as between the Account-Based model and the UTXO model. However, there are two key differences as compared with the UTXO model:

[63] As discussed in paragraph 4.1 of this Annex above, strictly speaking, each transaction in a UTXO system generates a new UTXO, as the string of data representing each transaction output is unique even if its associated value remains the same. We refer to paragraph 2.4 of Annex 2 (*Overview and key features of DLT*) and, in particular, footnote 29, where we draw this distinction.

5.2.1 Transactions in Account-Based models do not rely on "unspent transaction outputs".

Nothing within the transaction message is required to reference any prior inputs, outputs or other prior transaction data in order to be valid. Essentially, all that is required for the transaction to be verified as valid by validator nodes is: (i) for the balance of the sending account to be sufficient to cover the balance being transferred; and (ii) for the signature to be valid. If both are valid, the sending account is debited and the receiving account is credited with the value.[64] [65]

One consequence of this is that, once the transferred value/balance is recorded to the recipient account's address, that value/balance will be indistinguishable from any other value/balance within the same account. Any subset of that value/balance can be spent using the cryptographic signature.

Equally, in contrast with the UTXO model, there is no "change address" in the Account-Based context either. This is a natural consequence of the fact that a transaction does not need to consume outputs as inputs in order to be valid.

5.2.2 A transaction which is recorded in a successfully-mined block leads to the balance of an account recorded on the distributed ledger being updated.

When a transaction is validated and included in a block, the distributed ledger will record a state change, adding the value that has been transferred to the balance of the transferee account address, and debiting the balance of the transferor's address. It is when that value has been updated within the transferee's account that it becomes available to be spent by whoever knows the associated private key. This contrasts with the UTXO model, where it is the point at which the relevant transaction is recorded on the distributed ledger that the associated UTXO becomes available to spend.

5.3 How do cryptoassets in the Account-Based model come into existence?

As with the UTXO model, distributed records representing a new value in an Account-Based model come into existence in a variety of ways. In contrast to the UTXO model, however, no input is required in order for the transaction creating a new value to be validated.

[64] See: https://h2o.law.harvard.edu/text_blocks/30595 (Accessed May 2019).

[65] One additional feature in many Account-Based models which is designed to protect against "double-spend" is for validator nodes to check the "account nonce" of any sending participant. In most Account-Based systems, for each new transaction constructed by the accountholder and recorded on the distributed ledger, a change in the account nonce will also be recorded on the distributed ledger as part of the account record. Where two transactions reference the same account nonce, this may mean that a user is attempting to spend the same data twice and validating nodes may reject the proposed transaction.