Smart legal contracts

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Dear Law Commission,

I am writing in response to your call for evidence on smart contracts. I am immensely pleased that you are addressing the commercial and contract law issues surrounding this technology. Both businesses and practitioners stand to benefit greatly from further clarity and potential legislative developments in this field.

I believe that it is only polite if I provide some brief background about myself:

I am a lecturer on Blockchain & Entrepreneurship at Imperial College London, where I am completing a PhD in Computer Science (focusing, precisely, on smart legal contracts). I actively work with financial institutions and start-ups in the cryptoasset space. Earlier in my career, I worked as a lawyer in the City and as a smart contract developer. I am a member of the DLT Committee of the British Standards Institution. I hold an MSc in Law and Finance from the University of Oxford and an LLB from King’s College London.

My first impulse when reading your consultation was to attempt to address each of the questions that you had advanced. However, I realised that a lot of my thoughts are addressed in an academic paper that I wrote last year. I am therefore appending this paper to my letter, in the hope that you will find some of the perspectives shared there useful.

If I may, I would also like to observe that some of the definitions of technical concepts would benefit from further reconsideration or elaboration. I will highlight a few of these:

- “Blockchain” is not a form of DLT, but rather a data structure which databases (or ledgers) may adopt to organise their entries. The blockchain data structure can exist outside of a DLT network, even if it gained popularity in this context.
- “DLT” does not necessarily lead to nodes being able to update their ledgers instantaneously. There is often a delay in data being transmitted across the network.
- “Ether” is not the only cryptocurrency used in the Ethereum network – there are many.
- “Nodes” are not the only participants in a DLT network (i.e. users need not themselves run nodes to transact).
- “Permissioned DLT system”: there may not be a (single) central administrator, but a group of entities that collectively control access (as is the case with consortium-based networks)
- “Tokens” are not necessarily linked to an underlying asset of value, though participants may find them valuable nonetheless. The notion of intrinsic value is somewhat of a red herring.

Without meaning to sound pedantic, I believe that it is important to remove any ambiguity in definitions that may find their way into pieces of legislation and become subject to the scrutiny of the courts.

I make myself available for further discussions and comments, should this be of help.

Yours faithfully,
Smart Contracts: Taxonomy, Transaction Costs, and Design Trade-offs

Alfonso D. D. M. Rius*

Abstract

My aim in writing this article is to set out a conceptual, semantic and economic framework for the analysis of smart contracts. I seek to achieve this by tackling three interrelated areas. First, I delineate smart contracts' defining attributes and place them within the taxonomy of legal contracts. In doing so, I briefly examine smart contracts' history and highlight a number of entrenched misconceptions. Second, I analyse traditional contracting (within a contract law system) and smart contracts through the lens of new institutional economics. In particular, I consider settings in which each of these contracting methods, or combinations of both, can facilitate exchange by reducing transaction costs. Third, I evaluate smart contract designs comprised of different combinations of code and natural language. In doing so, I highlight a number of trade-offs arising from these designs and conclude by considering the impact of pseudonymity on transaction costs. In recognition of smart contracts' multidisciplinary underpinnings, the discussion throughout the article is supported with legal, economic and technical insights.

Introduction

Over the past few years, smart contracts have been in the limelight of entrepreneurs, professional advisers, and lawmakers alike. Despite the widespread fascination with the technology, its legal treatment, economic implications, and technical capabilities remain the subject of much debate. Since I reviewed the existing literature in 2017, there have been a number of important contributions. For instance, the LawTech Delivery Panel's recent guidance on smart contracts (LTDP Statement) is a much-welcomed step in the path towards greater legal clarity. On the economic sphere, the EU, IMF, and World Bank have all set out their views on the technology's business applications. From a technical perspective, the International Organization for Standardization has, through its national delegations, produced helpful guidelines for the use of technology.

Despite this traction, there is progress to be made in bridging theory and practice, as well as in laying down a structured analytical framework. The difficulty stems from the fact that smart contracts...

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4 See, eg, 'Blockchain and distributed ledger technologies – Overview of and interactions between smart contracts in blockchain and distributed technology systems' (ISO/TR 23455, 2019).
contracts have evolved through the cross-fertilisation of ideas from a wide range of disciplines.\(^5\) However, much of the commentary to date has been domain-specific and dispersed across formal and informal fora.\(^6\) These factors are the main culprits for the semantic walls that shelter specialists’ perspectives and turn the use of descriptive terminology into a game of minesweeper.\(^7\)

For the purposes of this article, a smart contract is an agreement whose performance is automated (at least in part) through the execution of code on a distributed ledger technology (DLT) network. In this article, I seek to explore the following three interrelated areas:

- First, I explore the taxonomy of contracts at large and, more specifically, smart contracts. I also consider the evolving usage of the smart contract term, which accounts for the lack of a settled definition. Further, I address certain misconceptions about smart contracts that have become entrenched in the literature.

- Second, I apply principles of new institutional economics to analyse the advantages and drawbacks of smart contracts over traditional contracts, with a focus on transaction costs.\(^8\) In addition, I highlight cases in which parties may benefit from the use of smart legal contracts.

- Third, I provide examples of the design trade-offs and risks that arise from different combinations of (written) natural language and code, using various financial applications as case studies.\(^9\) I also consider the impact of pseudonymity on transaction costs, showing that privacy is not a free lunch.

To address these topics, I will support my analysis with insights from a variety of fields, including law, economics, distributed computing, and finance. Since the discussion is oriented towards practitioners and academics from diverse backgrounds, I have sought to clarify the

\(^5\) See Nick Szabo, 'Smart contracts: Building blocks for digital markets' (1996): “the objectives and principles for the design of [smart contracts] are derived from legal principles, economic theory, and theories of reliable and secure protocols.”

\(^6\) See, eg, Josh Stark, 'Making Sense of Blockchain Smart Contracts' (2016): “The interdisciplinary nature of blockchain technology, and smart contracts in particular, leads people to see the technology as primarily belonging to their own discipline, at the expense of the others”. In Rius (n 1), I note that many influential articles on smart contracts have been written in online blog sites like Medium, which are often overlooked by academics.

\(^7\) See Rius (n 1). See also Eliza MIK, 'Smart contracts: Terminology, technical limitations and real world complexity' (2017) 9(2) Law, Innovation and Technology 269-300. In the broader context of DLT, see Nic Carter, 'Blockchain is a Semantic Wasteland' (2018) and Angela Walch, 'Blockchain's Treacherous Vocabulary: One more Challenge for Regulators' (2017) 21(2) Journal of Internet Law 9-16.


\(^9\) I use the term “natural language” throughout the paper in the context of writing (as opposed to speech). Although I have used the term “prose” in the past, e.g. in Rius (n 1), I am not convinced that one could not write legal contracts in iambic pentameter. I defer that consideration to future work.
10 In ‘Foundations of Blockchain Technology’ (2019), I analyse the core elements of the technology, highlight various applications (including Bitcoin) and dispel certain widespread misconceptions.

11 Gideon Greenspan, ‘Smart contracts: The good, the bad and the lazy’ (2015).

12 See, eg, Kevin Werbach and Nicholas Cornell, ‘Contracts Ex Machina’ (2019) 67 Duke Law Journal 313-382, 338: “The first question we must necessarily answer is then: What do we mean by a 'contract'?.” The authors, however, do not go on to consider the interpretations of the term outside the domain of law.

13 Definition derived from the Cambridge and Merriam-Webster online dictionaries (accessed 29 March 2020). From a legal practitioner’s perspective, see also Hugh Beale (ed), Chitty on Contracts (Sweet & Maxwell, 33rd ed, 2019): “a promise or set of promises which the law will enforce”.


15 LTDP (n 2) 31-32. For a cross-jurisdictional perspective, see Norton Rose Fulbright, ‘Can smart contracts be legally binding contracts?’ (2016). In common law jurisdictions, a ‘deed’ is a type of document that meets certain formality requirements and does not necessitate consideration to flow from each party in order to be legally binding.

use of technical and academic jargon. The discussion does, however, assume a non-technical familiarity with the core aspects of DLT.¹⁰

1. Contract taxonomy

1.1 Forms of contract

In the smart contract discourse, perhaps the one thing that commentators agree on is the absence of a settled definition for the very term. In fact, Greenspan quips that the term has been used to mean so many different things that we would be better off by banning it.¹¹ The lack of an established semantic and conceptual framework can lead commentators to talk at cross-purposes and impair analytical progress. However, the challenge does not stop here, as the use of the word ‘contract’ itself is regarded as contentious.¹²

The dominant, dictionary definition of ‘contract’ is an agreement (i.e. a collection of promises between two or more parties) which gives rise to a corresponding set of legally binding obligations.¹³ As Allen notes, contracts generate "special legal consequences" within a legal system’s logical universe in a way that non-qualifying promises do not.¹⁴ The requirements that need be met for an agreement to be legally binding vary from one legal system to another. The LTDP Statement reiterates the conditions that (at least in common law systems) typically need to be satisfied:

1. an agreement is reached in respect of terms that are sufficiently certain;
2. the parties objectively intended to be legally bound by this agreement; and
3. with certain exceptions, each party has provided something of benefit to the other (referred to as consideration), which need not be monetary in form.¹⁵

If I verbally agree to gift you my car, I may have a moral obligation to keep my word, but since there was no consideration from your part, I would most likely not have a legal obligation to do so. Since the conditions set out above have not been satisfied, you cannot enforce my
promise in court by obtaining a legal remedy if I default.\textsuperscript{16} Importantly, the law also subverts parties' ability to enforce contracts to matters of public interest, such as the desire to prevent criminal activity and facilitate insolvency proceedings. As Bourque and Fung Ling Tsui observe, even in jurisdictions in which the right to free speech is largely unfettered, the act of contracting is in fact a heavily regulated exercise.\textsuperscript{17}

On the other hand, the term 'contract' can mean something very different to a computer scientist.\textsuperscript{18} In particular, a computer scientist may not concern herself with whether an agreement is capable of being enforced \textit{in court}. Instead, she may see in (source) code the opportunity to set out and execute an agreed set of promises, for example, by registering the transfer of ownership to a digital asset on a distributed ledger. Further, there is long-standing precedent for the use of the term in economics and political philosophy to denote agreements that are not necessarily legally binding.\textsuperscript{19}

This semantic disparity has led lawyers to discount an important technological development on the basis that it is merely a "misnomer".\textsuperscript{20} Consequently, computer scientists are deprived of a recursive body of codified experience that has developed over centuries to streamline socially and commercially desirable patterns of behaviour, patching 'legal bugs' and resolving 'reasoning forks' through a process of trial-and-error.

To circumvent the potential for ambiguity, I will use the term 'legal contract' when referring to a legally binding agreement.

\textbf{1.2 An ontological clarification}

As part of this taxonomical exercise, it is helpful to distinguish between the existence of a legal contract and the manner in which this is initialised (and, where applicable, recorded). We can conceptualise a legal contract as an object that is initialised once the conditions prescribed by an applicable legal system have been met. This object acquires importance

\begin{itemize}
\item \textsuperscript{16} Common law systems draw the line at the notion of consideration, on the basis that a promisor can typically change their mind without the promisee incurring an economic loss. There are certain exceptions, such as when dealing with deeds, or when the doctrine of equitable estoppel comes into play. For the classic exposition of the latter, see \textit{Central London Property Trust Ltd v High Trees House Ltd} [1947] KB 130 per Denning J (obiter, as usual).
\item \textsuperscript{17} Samuel Bourque and Sara Fung Ling Tsui, \textit{A Lawyer's Introduction to Smart Contracts} (Lask: Scientia Nobilitat, 2014) 4-23, 13.
\item \textsuperscript{18} See Christian Colombo, Joshua Ellul and Gordon J Pace, 'Contracts over Smart Contracts: Recovering from Violations Dynamically' in Tiziana Margaria and Bernhard Steffen (eds), \textit{Leveraging Applications of Formal Methods, Verification and Validation} (Springer: Lecture Notes in Computer Science, vol 11247, 2018) 300-315, 300-301.
\item \textsuperscript{20} See, eg, Cheng Lim, T J Saw and Calum Sargeant, 'Smart contracts: Bridging the gap between expectation and reality' (2016), in the Oxford Business Law Blog.
\end{itemize}
within the legal dimension, as opposed to the state of nature or a virtual environment. As Allen observes, these objects "are invisible and their existence fundamentally mind-dependent, but they are as 'real' as the legal system itself can purport to be".21

This distinction is relevant for various reasons. If we misplace the document that initialises or records the contract (commonly also referred to as 'the contract'), the obligations that this set in motion do not generally evaporate into thin air.22 In addition, the law may imply terms into all kinds of legal contracts – no matter how they are initialised or documented – based on considerations of business efficacy, paternalism, and moral values. In certain situations, the courts can also authorise a contractual document to be rectified if its terms deviate from that which the parties intended (for instance, due to a typo).23

Second, a distinction can be drawn between a legal contract (as an object) and the means through which the obligations that it gives rise to are performed (or enforced).24 For example, the obligations set out in a legal contract that is initialised and recorded in natural language may be performed either by a person carrying out the prescribed actions or executed by an algorithm. In the latter case, the code would not ordinarily be regarded as being part of the legal contract. Here, the document is seen as the authoritative record and code is merely used to facilitate performance.25 On that basis, if the output of the execution deviates from that which the parties agreed, the courts would likely find that a default has occurred.

1.3 Forms of legal contracts

In this subsection, I wish to focus on the manner in which legal contracts can be initialised and (where applicable) recorded. The simplest form of agreement is an oral contract. For example, I may verbally agree to sell you my shares in Apple at a specific price. This resembles the open outcry system that floor traders use in many stock exchanges. While the agreement is time-efficient, there is little evidence of the agreed terms, so it may not be easy to satisfy a court that, on the balance of probabilities, a thing was said (or not). This leaves room for counterparty opportunism, an issue that I will explore in detail in section 2.

Legal contracts can also be initialised through parties' actions. For instance, when Bob walks into a store, picks up some goods, and pays at the counter, this chain of actions will cause a

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21 Allen (n 14) 15.
22 See Allen (n 14) 16: “A bearer bond, on the other hand, is specifically dependent on the existence of the document. If such a negotiable instrument is lost or destroyed, the object itself lapses into non-existence.”
23 For a discussion of the English legal doctrine of rectification, see Allen (n 14).
24 In the domain of law, the term 'enforcement' implies the involvement of some third party (or perhaps algorithm) to realise the promises that the parties have made (or, in the alternative, grant a legal remedy such as damages). In contrast, the terms 'performance' and 'enforcement' are used interchangeably in the economics literature, with 'self-enforcement' describing instances in which parties' incentives are aligned so as to encourage performance.
25 Allen (n 14) 7 provides the example of an e-commerce transaction: “Once I have entered my credit card details into Amazon.com... my click sets off a cascade of instructions such that the balance of my account on my bank's digital ledger is depleted by n units and the balance of the seller's account with its bank is increased by n units.” In this case, code is acting as an execution mechanism for the buyer's payment obligation, as opposed to serving as the agreed form record.
contract to be initialised between the store owner and Bob. This is notwithstanding the fact that Bob has not muttered a single word throughout the transaction. The law would, however, not stay quiet – certain fundamental terms would be implied into, and come to form part of, the legal contract. For example, Bob would be entitled to a refund as a matter of law if the goods are later found to be of sub-par quality or if he decides to change his mind within the statutory cooling-off period.26

Agreements in the realm of business are, of course, commonly recorded through the use of natural language and initialised by means of a signature. The latter is taken as a widely accepted signal that a party intends to be legally bound. Even if a preliminary oral agreement has been reached a business setting, it is common to 'memorialise' this in a natural language document, which will typically dominate in the event of an inconsistency. In contrast to oral agreements, natural language documents are more precise, easier to amend during the negotiation stage, and less susceptible to disputes regarding parties' intentions.

On the other hand, algorithmic contracts are those that are initialised by, and whose terms are recorded in, code.27 Financial markets are dominated by these types of contracts, as they permit a large volume of transactions to be executed in fractions of a second. If I place an order on a regulated trading venue, I may not know who my counterparty is, let alone had the chance to formalise our relationship in natural language, as it would be too time-consuming to do so. Nonetheless, I accept that by placing an order on said venue, I am agreeing to enter into a legally binding relationship with whichever party happens to match my order.28

Last, hybrid contracts are those that are initialised through, and therefore recorded in, a combination of natural language and code. For instance, an algorithmic contract may reference a 'natural language wrapper', whose terms are incorporated into the associated code (or vice versa). To revisit the trading analogy, a party may have entered into a master agreement with a broker to cover all of the individual algorithmic trades that are placed through the broker's API. In this case, the master agreement serves as an umbrella contract that contains provisions of general applicability, thereby reducing the number of transaction-specific parameters that need to be agreed per trade.

In light of the various forms of legal contracts, the optional choice of form for initialising and recording a contract will be transaction-specific. I will expand on these considerations when evaluating different smart contract designs in section 3.

26 In the context of English Law, see the Sale of Goods Act 1979 s 14 (on implied terms as to quality and fitness) and The Consumer Contracts (Information, Cancellation and Additional Charges) Regulations 2013 reg 29 (on the cooling-off period).
28 In practice, the relationship between trading parties may be complicated by the presence of clearinghouses and trade executions by brokers acting on an agency basis.
1.4 Smart contracts: evolution of the term

The term 'smart contract' was coined in 1994 by Nick Szabo, who defined this as a "computerized transaction protocol that executes the terms of a contract". By contract, Szabo is relying on the computer science interpretation of the term: "A smart contract makes no attempt to be legally binding." Instead, Szabo envisions a protocol (or program) that initialises, records, and enforces an agreed set of terms. It is this last characteristic that might be said to endow these protocols with a dose of 'smartness'. Szabo regards smart contracts as a transactional tool capable of preventing contractual breaches, lowering enforcement costs, and minimising the need to rely on intermediaries.

Szabo's original conception of the term is abstract in form and, since it is not tied to a specific technology, overlaps with the notion of an algorithmic contract. In his articles, Szabo pinpoints the vending machine as a primitive example of a smart contract. Szabo also associates smart contracts with digital cash protocols, which utilise cryptographic techniques like public key encryption and digital signatures to procure enforcement and avert unauthorised actions. However, Szabo's definition does not indicate that cryptographic primitives are a necessary component of smart contracts.

While Szabo and other cypherpunks sought to develop smart contracting systems in the early 2000s, the notion remained largely unexplored outside of this ideological community. The launch of the Bitcoin network in 2009, which made use of various cryptographic techniques that Szabo had referenced in his articles, marked a turning point in the smart contract discourse. In addition to outright transfers of the network's native cryptoasset (BTC), Bitcoin's programming language (Script) permits the deployment of state-contingent transactions, where BTC can only be spent if a set of prescribed conditions are met (such as a multisignature requirement).

Although Bitcoin shed light on smart contracts, it was the launch of the Ethereum network in 2015 that popularised the concept. In Ethereum's whitepaper, the term is used rather broadly to cover any piece of code that is capable of being executed by the networked nodes, and the

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29 Nick Szabo, 'Smart Contracts' (1994). In 'Smart Contracts: Building Blocks for Digital Markets' (1997), Szabo defines a smart contract as “a set of promises, specified in digital form, including protocols within which the parties perform on these promises.” See also Nick Szabo, 'Formalizing and Securing Relationships on Public Networks' (1 September 1997) 2(9) First Monday.


31 Ibid 5: “In terms of computer technology, smart contracts are software modelled on contractual relationships that facilitate negotiations and incentivize performance via control of assets.”


output of which will be recorded (in encoded form) on the network's distributed ledger.\textsuperscript{35} In hindsight, Vitalik has recognised that the use of the phrase "persistent scripts" to describe these programs would have been less ambiguous.\textsuperscript{36} Other networks have opted to christen these programs with more technical names (like Hyperledger Fabric's \textit{chaincode}). However, as Brent Miller observes, this sacrifices part of the term's glamour and marketability.\textsuperscript{37}

So how are we to reconcile the various uses of the term? At present, the popular approach amongst commentators (and legislators) is to treat DLT networks as an essential ingredient in the definition of a smart contract.\textsuperscript{38} Perhaps this is indicative of some sort of 'AI effect', insofar as algorithms that we previously regarded as 'smart' (like those powering vending machines) now fail to impress us.\textsuperscript{39} Other commentators prefer to adopt a technology-agnostic definition of the term.\textsuperscript{40} Szabo himself has more recently drawn a distinction between the abstract and DLT-specific uses of the term, both of which he regards as valid.\textsuperscript{41} While not eliminating the potential for ambiguity, such a reconciliatory view is nonetheless helpful, provided that one clarifies which stream they intend to follow.

I will use the term 'smart contract' solely in the context of DLT networks, as I wish to avoid overlap with the broader notion of algorithmic contracts, instances of which precede Szabo's conception.

1.5 Smart contracts: inherent traits and misconceptions

In contrast to more established forms of algorithmic contracts, smart contracts are able to leverage the uniformity, fast settlement, and security assurances of DLT networks. In this environment, smart contracts have given rise to novel forms of fundraising, collaborative applications, and organisational forms. During the ICO boom of 2017-2018, it seemed that


\textsuperscript{36} See Vitalik's tweet on 13 October 2018: ‘To be clear, at this point I quite regret adopting the term 'smart contracts'. I should have called them something more boring and technical, perhaps something like 'persistent scripts’.” In this context, persistence refers to the characteristic of state being stored and outliving the process that created it.

\textsuperscript{37} Brent Miller, 'Smart Contracts and the Role of Lawyers - About “Code is Law”' (2016).

\textsuperscript{38} See, eg, Maher Alharby and Aad van Moorsel, 'Blockchain-Based Smart Contracts: A Systematic Mapping Study' (2017) 9(5) \textit{International Journal of Computer Science and Information Technology} 151-164, 151: “A smart contract is executable code that runs on the blockchain to facilitate, execute and enforce the terms of an agreement between untrusted [sic] parties.”

\textsuperscript{39} On the 'AI effect', see, eg, Pamela McCorduck, \textit{Machines Who Think: A Personal Enquiry Into the History and Prospects of Artificial Intelligence} (Routledge, 2nd ed, 2004) 204: “it’s part of the history of the field of artificial intelligence that every time somebody figured out how to make a computer do something—play good checkers, solve simple but relatively informal problems—there was a chorus of critics to say, but that’s not thinking.”


\textsuperscript{41} Szabo (n 30) 4-6.
there was no problem too large (or too little) that a smart contract could not eradicate.\textsuperscript{42} Armed with a golden hammer, entrepreneurs and developers came to attribute all sorts of magical characteristics to smart contracts.\textsuperscript{43} I have set out below various misconceptions that have become entrenched in the literature.

- **Immutable/tamper-proof/tamper-resistant**: computer scientists tend to use these terms to indicate that (at least certain) components of a smart contract cannot easily be altered once deployed.\textsuperscript{44} Nonetheless, the use of this term is dangerously misleading for the unsuspecting user. In permissionless networks, the demise of The DAO has evidenced how a protocol can be altered to retrospectively annul the effects of a previously valid transaction.\textsuperscript{45} In addition, there is ongoing work on the development of standards for upgradable contracts that enable functions to be replaced after they have been deployed.\textsuperscript{46} In permission networks, participants are typically well-placed to coordinate to replace smart contract code or relax the rules of the network’s protocol to permit authorised entities to edit deployed code.\textsuperscript{47}

- **Autonomous/decentralised/trustless**: smart contracts are not necessarily autonomous (or, by extension, decentralised or trustless). These terms are frequently used in the context of Ethereum to describe the accounts that smart contract code is linked to, as these do not have a corresponding private key that users can control. However, smart contracts can (and usually do) have a contract ‘owner’ with the ability to call certain reserved functions. For instance, a token issuer may grant themselves the ability to cancel the sale at any time or even to unwind transactions.\textsuperscript{48} Parties need also trust the developers that oversee a network’s protocol or are engaged to write


\textsuperscript{43}See generally Rius (n 1), Walch (n 7 and n 49) and MIK (n 7). A golden hammer is an application of the ‘Law of the Instrument’, introduced in the computer science literature on anti-patterns (programming practices to be avoided). See, eg, William J Brown, Raphael C Malveau, Hays W “Skip” McCormick and Thomas J Mowbray, AntiPatterns: Refactoring Software, Architectures, and Projects in Crisis (Wiley, 1998) 111.

\textsuperscript{44}See Rius (n 1). In Ethereum, the variables that are stored in a contract account can be altered, whereas the functions themselves are harder to replace.

\textsuperscript{45}On the demise of The DAO, see, eg, Rius (n 1) and Alan Cunningham, ‘Decentralisation, Distrust & Fear of the Body – The Worrying Rise of Crypto-Law’ (2016) 13(3) \textit{SCRIPTed} 236-257, 237-238.


\textsuperscript{47}For instance, Accenture has obtained a patent for an “editable blockchain” that utilises “chameleon hash functions”. This feature could be implemented in DLT networks to alter the ledgers’ data in the event of an error or fraud.

Due to these factors, Walch warns that DLT networks, far from displacing the need for trust, are merely "trust-shifting". In this vein, a writer for The Economist argues that the 'illusion of trustlessness' has served to mask a transfer of wealth to a technocratic elite.

- **Self-executing/self-enforcing:** smart contracts are not necessarily self-executing nor self-enforcing. It is, of course, possible for a simultaneous exchange to be effected via smart contracts, as is the case with an ICO contribution. However, this logic does not extend to transactions with a temporal component. In DLT networks, actions cannot be executed at a precise point in time, since it is difficult to synchronise clocks across spatially distributed nodes (due to 'clock drift'). Similarly, the process of obtaining data from off-ledger sources (like a finance website) cannot generally be automated with on-ledger code, as this would provide non-deterministic results and compromise the consensus process. The solution to these problems revolves around the use of an 'oracle', namely a manual execution or external algorithm that passes on the relevant parameters (such as the price of a stock) to a function in the smart contract.

These distinctions are important, as we ought to minimise any potential for ambiguity in a definition that could eventually make its way into a piece of legislation and become subject to legal scrutiny by the courts. While it may be useful to consider industry jargon as a

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49 Lawrence Lessig, 'Code is Law' (Harvard Magazine, January-February 2000): “the choice is not whether people will decide how cyberspace regulates. People – coders – will. The only choice is whether we collectively will have a role in their choice – and thus in determining how these values regulate – or whether collectively we will allow the coders to select our values for us.” See also Stephen Mason and Timothy S Reiniger, "'Trust' Between Machines? Establishing Identity Between Humans and Software Code, or whether You Know it is a Dog, and if so, which Dog?" (2015) 5 Computer and Telecommunications Law Review 135-148, 144: “this also implies a chain of trust to include the manufacturer, software writers, standards organisations and suchlike.” For a discussion of “sticky defaults” and user biases, see Vitalik Buterin, 'Software and Bounded Rationality' (2014). For an application of fiduciary principles to coders, see Angela Walch, 'In Code(rs) We Trust: Software Developers as Fiduciaries in Public Blockchains' in Regulating Blockchain: Techno-Social and Legal Challenges (Oxford University Press, 2019) ch 3.

50 See Walch (n 49) 59: “though [Szabo describes blockchains] as ‘trust-minimized’, I see them as ‘trust-shifting’; the need to trust in others has simply moved from its traditional place (e.g. the officers and directors of a *bona fide* corporation), leaving us to discern where it has landed.” See also Cunningham (n 45) 249.

51 The Economist, 'The great chain of being sure about things' (31 October 2015): “the latest techy attempt to spread a ‘Californian ideology’ which promises salvation through technology-induced decentralisation while ignoring and obfuscating the realities of power – and happily concentrating vast wealth in the hands of an elite.”


53 See Alfonso D D M Rius and Amila Kulasinghe, 'Responses to Public Consultations on Blockchain and Smart Contracts' (2019-2020). See also Walch (n 7).
common starting point, it is also necessary to recognise where this is the product of inflated expectations or desiderata, as opposed to inherent properties.\textsuperscript{54}

1.6 Types of smart contracts

Based on the broad interpretation of the term 'contract', a smart contract may (but need not) be legally binding. Stark's distinction between \textit{smart legal contracts} and \textit{smart contract code} is helpful in this context.\textsuperscript{55} Smart contract code is the overarching term that refers to a program that is intended to govern the relationship between two or more DLT users and can be executed by the nodes in said network. Presumably, we should exclude from this definition code that is not designed to govern user relationships, for instance, if this merely serves as a data repository or library for other smart contracts.

In turn, we refer to smart legal contracts as the subset of smart contract code that is also legally binding. This may be as a result of the code itself initialising and recording the terms of a legal contract or due to the presence of an external agreement (oral, implied or written in natural language) that endows the code with legal enforceability.\textsuperscript{56} The LTDP Statement has recently endorsed this position in relation to English law, helping to put an end to the characterisation of smart contracts as a misnomer.\textsuperscript{57}

There are a couple of variants of the smart contract concept that are worth exploring. The notion of a \textit{split contract} was introduced by Mark Miller in 1997 to describe an agreement that comprises both natural language, smart contract code, and an interface to cryptographically link both.\textsuperscript{58} Miller regards the American Information Exchange (AMIX) as an early example of a split contracting system.\textsuperscript{59} AMIX was created in the late 80s to enable customers to request information from experts in exchange for a consultation fee. Within AMIX, contracts embodied two different mediums of expression: natural language to express the question to be answered and the agreed compensation, and code that the AMIX system could understand.

\textsuperscript{54} See fn 7. In the broader context of blockchain, see Daniel Conte de Leon, Antonius Q Stalick, Ananth A Jillepalli, Michael A Haney and Frederick T Sheldon, 'Blockchain: properties and misconceptions' (2017) 11(3) \textit{Asia Pacific Journal of Innovation and Entrepreneurship} 286-300.

\textsuperscript{55} Stark (n 6).

\textsuperscript{56} Rius (n 1).

\textsuperscript{57} LTDP (n 2) 32: “The precise role played by software in a smart contract can vary: Alice and Bob may contract on the basis that their obligations are defined by the code and that they abide by the behaviour of the code whatever it does; or they may contract on the basis that code will be used to implement their agreement but not define it; or they may contract on some hybrid basis, where some obligations are defined by code, others merely implemented by code and perhaps others not involving code at all. There is a spectrum.” See also the discussion in section 3.2.

\textsuperscript{58} Mark S Miller, 'Computer Security as the Future of Law' (Conference Paper, EXTRO 3, 9 August 1997). See also Mark S Miller and Marc Stiegler, 'The Digital Path: Smart Contracts and the Third World' in J Birner and P Garrouste (eds), \textit{Markets, Information and Communication: Austrian Perspectives on the Internet Economy} (Routledge, 2003): “smart contracts will be unable to express the subtle richness of contracts written in natural language, leading to techniques for combining the two kinds of contract elements into \textit{split contracts}.”

and process. Upon delivery of the information, the transferee could either accept the transferor's document and make a payment or reject the document by marking it as inadequate. In the latter case, the system would deliver the request (in natural language) and the transferor's document to a human arbitrator, who would provide finality to the parties' dispute.60

Ian Grigg's *Ricardian contract* is (at least in its current usage) a subsequent variation of the smart contract concept. The Ricardian contract was introduced by Grigg in 1996 as an element of the Ricardo payment system.61 According to Grigg's original conception, a Ricardian contract would look like a conventional natural language contract, though it would also incorporate certain machine-readable tags to allow the document to be classified in accordance with a computer system's protocol, for instance for accounting purposes. Ricardian contracts would also make use of digital signatures to allow parties to transact in a pseudonymous manner. Grigg explains that Ricardian contracts did not initially embody any executable code, as there was no demand for this at the time. Until recently, Grigg argued that Ricardian contracts and smart contracts were each addressing a separate set of issues.62 However, Grigg notes that as a result of the increasing adoption of smart contracts, the concept of executable code came to be imported into the Ricardian contract.63 Ricardian contracts now appear to be commonly associated with interlinked natural language and code-based templates that parties can populate with deal-specific parameters.64 So understood, they could be characterised as a specific structure that split contracts can adopt.

2. Smart contracts and contract law: a transaction costs approach

2.1 Framing the challenge

As smart contracts began to gain traction, big corporates and professional advisers hastily implemented R&D programmes for fear of disruptive innovation.65 In addition, they made sure to aggressively market their use of the technology. Even where the technology was knowingly being misapplied or failing to generate returns, its use might perhaps be justified on strategic grounds alone – as an investment in signalling the company's commitment to delivering better services through innovation. This position is clearly unsustainable in the long run. Unless the technology is proven to yield positive results, a 'smart contract winter' may fall upon us.66

60 Note that, if the natural language is regarded as authoritative, the code would be relegated to a serve as an enforcement mechanism (see section 3.2).
62 Ian Grigg, 'On the intersection of Ricardian and Smart Contracts' (2015): “Both are trying to improve our agreements at different points and in different ways, within the overall framework of a contract in law.”
64 See Ian Grigg, 'Implementations of Ricardian contracts'. See also Clack et al (n 40).
We might assume that rational economic agents are incentivised to adopt the most efficient transactional structure that is available and known to them. On that basis, the fact that value is still being exchanged through smart contracts would suggest that they must currently be the first-best transactional structure in at least some settings.\(^{67}\) However, user pseudonymity obfuscates the extent to which smart contacts are being used to engage in socially undesirable or criminal activities, such as drug trafficking, money laundering, and tax avoidance.\(^{68}\) As such, the challenge is one of establishing that the technology is capable of having a net welfare-enhancing effect on society, with the internet itself being a clear instance of technology with net positive effects.\(^{69}\)

2.2 The transaction costs framework

Smart contracts are an institutional technology that enables the formation of new types of contracts and organisations. On that basis, Davidson et al. suggest that a useful analytical framework to assess the merits of this technology is that of new institutional economics, with an emphasis on transaction costs.\(^{70}\) Indeed, Szabo and Miller applied principles from this framework when analysing the potential merits of smart contracts over traditional contracts.\(^{71}\) In this section, I wish to examine traditional contracting (within a contract law system) and smart contracts through this lens of transaction costs. In doing so, I will identify situations in which combining attributes of both (in the form of smart legal contracts) might be optimal in order to minimise transaction costs.

Economic agents enter into market transactions to exchange goods, services, or money (an option to defer consumption on the former) in order to derive some utility (a subjective benefit). However, economic agents are not omniscient beings. In particular, they may be ignorant about the existence and location of trading opportunities, how to arrive at a mutually agreeable set of terms, and lack certainty about how sequential performance will unfold.\(^{72}\) This state of imperfect information can give rise to a number of costs that erode economic

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\(^{70}\) Sinclair Davidson, Primavera De Filippi and Jason Potts, ‘Economics of Blockchain’ (2016) 8. See also Massimiliano Vatiero, ‘Smart contracts and transaction costs’ (Discussion Paper, University of Pisa, Dipartimento di Economia e Management, 2018/238).

\(^{71}\) See Szabo (n 29, 30). See also Miller and Stiegler (n 58).

agents’ resources and disincentivise transactional activity.\textsuperscript{73} The table below lists the main types of transaction costs that may come into play throughout the contract lifecycle.\textsuperscript{74}

<table>
<thead>
<tr>
<th>Common Stage</th>
<th>Type of Costs</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ex Ante</strong></td>
<td><strong>Search costs</strong></td>
<td>Finding a counterparty with the desire to trade a specific good or service within a given price range</td>
</tr>
<tr>
<td><strong>Before initialisation</strong></td>
<td><strong>Measurement costs</strong></td>
<td>Defining the physical and property rights dimensions of the exchange</td>
</tr>
<tr>
<td><strong>Negotiation costs</strong></td>
<td></td>
<td>Bargaining on economic parameters, the delineation of property rights, and the allocation of risk</td>
</tr>
<tr>
<td><strong>Agency costs</strong></td>
<td></td>
<td>Engaging third party agents to define and formalise the conditions of exchange</td>
</tr>
<tr>
<td><strong>Ex Post</strong></td>
<td><strong>Monitoring and verification costs</strong></td>
<td>Tracking a counterparty’s compliance with their obligations and verifying adequate performance</td>
</tr>
<tr>
<td><strong>After initialisation</strong></td>
<td><strong>Enforcement costs</strong></td>
<td>Ensuring that a counterparty adheres to their obligations, or, alternatively, that the non-defaulting party receives compensation following a default</td>
</tr>
</tbody>
</table>

In a world of transaction costs, institutions play an important role in constraining or enabling economic agents’ behaviour.\textsuperscript{75} In the economics literature, institutions are defined as humanly-devised systems of formal rules (like the law) or informal norms (like cultural conventions) that shape social, economic and political interactions.\textsuperscript{76} Technology itself can


\textsuperscript{74} This list is not intended to be exhaustive, and the types of costs outlined may arise at different stages of the contract lifecycle (i.e. both ex ante and ex post). For a similar classification, see Steven M Jaffee and John Morton, *Marketing Africa’s High-Value Foods: Comparative Experiences of an Emergent Private Sector* (Kendall/Hunt, 1995) 30. Smart contracts may lower “transfer costs” by taking advantage of a DLT network’s settlement speed and security assurances.

\textsuperscript{75} Douglass C North, ‘Transaction Costs, Institutions and Economic Performance‘ (International Center for Economic Growth, Occasional Papers Number 30, 1992) 6. On institutions and technology, see Trevor Pinch, 'Technology and institutions: living in a material world' (2008) 37 *Theory and Society* 461-483. See also Nick Szabo, 'Money, Blockchains and Social Scalability' (2017): “The social scalability of an institutional technology depends on how that technology constrains or motivates participation in that institution, including protection of participants and the institution itself from harmful participation or attack.”

also facilitate or hinder transactional behaviour, as Lawrence Lessig noted with his "code is law" proposition (perhaps best interpreted as 'code as an institution').\footnote{Lawrence Lessig, Code Version 2.0 (Basic Books, 2006) 123. See generally Aaron Wright and Primavera de Filippi, 'Decentralized Blockchain Technology and the Rise of Lex Cryptographia' (2015). See also Vili Lehdonvirta and Robjeh Ali, 'Governance and Regulation' in UK Government Office for Science, Distributed Ledger Technology: beyond block chain (2019) 40-45, 41. Miller (n 37) explains that there are now incompatible (re)interpretations of the “code is law” proposition, so much so, that it is invoked to defend diametrically opposed viewpoints.} Multi-sided platforms like eBay, Uber and Airbnb are a good example of effective technological institutions. These platforms offer text searches, contract standardisation, ratings and online dispute resolution as a means of mitigating the various forms of transaction costs that parties might otherwise incur.\footnote{Szabo (n 30) 13. See also David Friedman, Contracts in Cyberspace (Berkeley Program in Law and Economics, 2000) ch VII.}

### 2.2.1 Search costs

Search costs are commonly overlooked, as they are often not observable or easy to quantify.\footnote{See, eg, Douglass C North and John J Wallis, 'Integrating Institutional Change and Technical Change in Economic History: A Transaction Cost Approach' (1994) 150(4) Journal of Institutional and Theoretical Economics 609-624, 612. On the impact of information on search costs, see George Stigler, 'The Economics of Information' (1961) 69(3) Journal of Political Economy 213-225.} They encompass the tangible and intangible resources (like time) that are consumed in finding and screening a potential counterparty. In most cases, smart contracts are linked to a user-friendly interface that facilitates interactions with the code, such as a website or a trading venue. Given that smart contracts are generally dependent on existing web tools, it is not evident that their use would yield comparatively lower search costs. One could, however, point to specific examples in which smart contracts have contributed to a reduction in search costs. In broad terms, they have facilitated the search for willing investors in early-stage tech projects by enabling the ICO funding model, facilitating capital formation and entrepreneurship.\footnote{See Saurabh Ahluwalia, Raj V Mahto, and Maribel Guerrero, 'Blockchain Technology and Startup Financing: A Transaction Cost Economics Perspective' (2020) 151 Technological Forecasting and Social Change 1-25, 8: “In entrepreneurial finance, a high environmental uncertainty and a high information asymmetry between entrepreneur(s) and investors significantly enhances transaction costs involved in financing.” At 17-18: “The primary cost reduction [with DLT] is achieved by reducing search costs.”}

### 2.2.2 Measurement costs

Measurement costs are incurred in defining the conditions of the exchange. Two important problems arise in this regard. The first is that information is typically costly to acquire and asymmetrically spread. A seller with an informational advantage may thus be tempted to exploit this asymmetry to sell a low-quality good to an unsuspecting buyer (the problem of ‘adverse selection’).\footnote{George A Akerlof, 'The Market for “Lemons”: Quality Uncertainty and the Market Mechanism' (1970) 84(3) Quarterly Journal of Economics 488-500.} A buyer can insert protection mechanisms into their legal contract, for instance, by including warranties as to the state of the goods. In addition, contract law will
imply certain rights into consumer dealings to accelerate transactional activity and protect consumers from abusive behaviour (see section 1.3). A clear example of this under English law is the "red hand rule", which requires parties to highlight any terms that are unusual and detrimental to an unsophisticated counterparty. We can contrast this position with that of many ICOs, in which participants who fail to read the 'fine print' may be left with little more than tokens of gratitude.

The second problem affecting measurement costs is that of contractual incompleteness. Since parties are not omniscient, they are unable to foresee every possible event (or 'state') that may materialise. As Williamson notes, the mind - being a scarce resource itself - must specialise. To the extent that parties can determine, with a high confidence interval, the probability of given states materialising ("weak uncertainty"), they may proceed to allocate property rights (and consequently risk) in each such state. Importantly, contractual incompleteness can also arise from the prohibitive negotiation costs involved in allocating risk in every foreseeable state. To mitigate these issues, contract law systems provide a series of mandatory and default positions that allocate risk when matters are left unspecified.

Smart contracts cannot circumvent these problems, as they are engineered by humans with limited foresight and constraints on resources. This alone suggests that parties relying on smart contracts could benefit from resorting to the aforementioned contract law principles. The most obvious way of achieving this would be through the design of smart legal contracts. An alternative approach entails embedding contract law principles in the code, perhaps by creating an ontology of common legal concepts and publishing the associated code in an open-source library. Attempts to formalise core contract law principles have highlighted the limitations inherent in this approach. Further, contract law principles often require the consideration of subjective matters and the exercise of discretion, which a human-centric enforcement mechanism can cater to.

82 J Spurling Ltd v Bradshaw [1956] EWCA Civ 3 per Denning LJ.
83 See especially Oliver Hart and John Moore, 'Incomplete Contracts and Renegotiation' (1988) 56(4) Econometrica 755-785, 755: "When drawing up a contract, it is often impracticable for the parties to specify all the relevant contingencies. In particular, they may be unable to describe the states of the world in enough detail that an outsider (the courts) could later verify which state has occurred, and so the contract will be incomplete."
84 Williamson (n 67) 600.
85 See David Dequech, 'Uncertainty: A Typology and Refinements of Existing Concepts' (2011) XLV(3) Journal of Economic Issues XLV 621-640. For the classic distinction between measurable uncertainty (risk) and "true" uncertainty, see Frank Knight, Risk, Uncertainty and Profit (Houghton Mifflin Company, 1921).
86 See, eg, Hart and Moore (n 83).
87 In (n 30) 14, Szabo states that "Traditional law and smart contracts work best in synergy, when the lawyers and software engineers act as a team to secure the terms and conditions of a deal." Cf Szabo (n 30) 17: "Asking whether smart contracts need to be legally enforceable is akin to asking whether courts need to examine the guts of a vending machine to figure out what parties intended."
88 For an ontology of contract law concepts tailored towards smart contracts, see Rius (n 1).
2.2.3 Negotiation costs

Negotiation costs are linked to measurement costs, as they arise in the course of scoping the zone of potential agreement (or lack thereof) and defining the distribution of rights and obligations.\textsuperscript{90} Negotiation costs are minimised when dealing with regulated, liquid markets for homogenous products with standardised contractual terms, as is the case with securities in financial exchanges. By reducing transaction costs, these venues allow parties to focus on market prices alone, as these carry the information necessary to coordinate trades.\textsuperscript{91}

When dealing with smart contracts, the entire negotiation process may take place on-ledger. In this scenario, the smart contract can be characterised as a unilateral offer.\textsuperscript{92} A party wishing to take this offer up will call the desired function and transfer the requisite payment. The use of technical standards for tokens (like ERC-20) enable a number of capabilities to be homogenised, facilitating transferability and trading on exchanges (both on-ledger and off-ledger).\textsuperscript{93} Alternatively, parties might have negotiated the entire agreement off-ledger, with smart contracts being used merely as a means of automating performance. This latter scenario is more likely to arise in closed networks in which parties' identity is known.\textsuperscript{94}

2.2.4 Agency costs

In the principal-agent literature, 'principals' are persons who delegate work to others (the 'agents').\textsuperscript{95} There are certain transaction costs that principals (i.e. parties to a contract) face. For instance, principals may fall short of achieving a desired outcome due to a lack of intelligence, experience or access to valuable resources (including information).\textsuperscript{96} As such, principals may be better off by engaging an agent who can increase the value that they derive from the transaction.\textsuperscript{97} Lawyers are a class of agents that pervades the realm of traditional contacts. Lawyers' specialisation in structuring transactions to protect principals' interests and generate additional value has led them to be characterised as "transaction cost engineers".\textsuperscript{98}

\begin{itemize}
\item \textsuperscript{90} On negotiation habits and the zone of potential agreement, see Roger Fisher and William Ury, \textit{Getting To Yes: Negotiating an agreement without giving in} (Random House, 2012).
\item \textsuperscript{91} On the role of price as a coordinating agent, see Friedrich A Hayek, "The Use of Knowledge in Society" (1945) 35(4) American Economic Review 519-530.
\item \textsuperscript{92} A unilateral offer is one that is made to the world at large, as opposed to being targeted to a specific person. Such an offer is capable of being legally binding, as established in the classic case of \textit{Carlill v Carbolic Smoke Ball Company} [1892] EWCA Civ 1.
\item \textsuperscript{93} For a specification of the ERC-20 standard, see <https://eips.ethereum.org/EIPS/eip-20>.
\item \textsuperscript{94} I use the terms open/closed, private/public and permissioned/permissionless in accordance with the distinction drawn in Rius (n 10).
\item \textsuperscript{96} In a managerial setting, see Zohar Gosher and Richard Squire, 'Principal Costs: A New Theory for Corporate Law and Governance' (2017) 117(3) Columbia Law Review 767-829, 795.
\item \textsuperscript{97} This should not be confused with the notion of an "economic agent", which includes any person involved in a transaction (in this context, both principals and agents).
\item \textsuperscript{98} Ronald J Gilson, 'Value Creation by Business Lawyers: Legal Skills and Asset Pricing' (1984) 94 Yale Law Journal 239, 241 (applying the so-called(?) "Coase Theorem" to firms' capital structure). Of
\end{itemize}
The use of an agent in this setting comprises a ‘transaction within a transaction’, meaning that the relationship carries its very own set of transaction costs. Aside from outright fees, these include competence costs (mitigated by reputation signals), conflict costs (constrained by regulation), monitoring to prevent shirking (with regular updates), and enforcement costs where the agent fails to perform to a satisfactory standard. If agents are sheltered from the outcome of a transaction, they may decide to act opportunistically (the ‘moral hazard’ problem). In the realm of traditional contracts, this risk is mitigated by the tort of negligence, which incentivises lawyers to perform to industry standards. Principals can also incorporate explicit incentive alignment mechanisms into their agency contracts, for instance, in the form of success fees.

It is common for smart contract advocates to argue that the technology will facilitate transactional activity without intermediaries, thereby eliminating agency costs. In practice, not all principals are technically sophisticated or wish to spend their time formalising and auditing encoded terms. Therefore, reliance on third-party developers seems inescapable. Crucially, developers are not upheld to the same rigorous standards as lawyers, nor are they required by law to take out professional indemnity insurance. It is hard for a developer to be found negligent, since the presence of bugs in code is treated as ‘business as usual’. As one English judge put it: “The expert evidence showed that it is regarded as acceptable practice to supply computer programmes (including system software) that contain errors and bugs.” While this stance might perhaps incentivise technological innovation, it does little to disincentivise moral hazard and leaves principals trapped in a ‘liability lacuna’. Even worse, there is a perverse incentive for developers who are familiar with the code to take advantage of user pseudonymity to exploit deliberate vulnerabilities in the code (an ‘inside job’).

Parties who wish to create smart legal contracts will most likely need to engage both lawyers and developers as agents in their transaction. Apart from running the risk of accumulating agency costs, there is also the prospect of miscommunication between agents. To address this challenge, Khalil et al. advocate for the development of a new hybrid language that both sets of agents can work from, though it would probably be more efficient in the long run if course, access to intellectual capital and reputation signals are also amongst the motives for using lawyers.

99 See, eg, Wulf A Kaal, ‘Blockchain Solutions for Agency Problems in Corporate Governance’ in Kashi R Balachandran (ed), Economic Information to Facilitate Decision Making (World Scientific Publishers, 2019): “Agency relationships in smart contracts run exactly as coded without any possibility of opportunistic behavior of the agent. Information asymmetries between principal and agent, censorship, opportunism of agents, breaches of fiduciary duties, liability rules for principals and agents, fraud or third party interference are removed entirely... Agency related governance in the blockchain takes place without intermediaries.”


101 Eurodynamic Systems Plc v General Automation Ltd (6 September 1988, not reported) QBD, 1983 D 2804, [5.a] per Steyn J. This does not prevent developers from being sued for breach of contract.
more lawyers learned how to program. As the contracting paradigm shifts to a world "code and law", lawyers could well evolve into a specialised subset of developers.

2.2.5 Monitoring and verification costs

Most contractual obligations are state-contingent, meaning that they will only be triggered when a predefined state materialises (such as receipt of payment). For this reason, a party will want to monitor whether a relevant state has arisen so as to comply with any active obligations within the agreed timeframe. Having visibility over the stage of the transaction can also help parties to plan and identify whether a counterparty is delaying performance. In traditional contracting, parties may need to employ agents (such as accountants) to verify whether an action has been performed, as they may lack the expertise to do so. Alternatively, parties might wish to reduce the ‘dispute surface’ by relying on the determination of an independent expert whose conduct is constrained by regulation and industry standards.

Gans argues that smart contracts can lead to a reduction in monitoring costs; since state itself is recorded in the distributed ledger, parties may be able to monitor the contract lifecycle in close to real-time. Indeed, smart contracts can be programmed to automate parties' performance, with actions being executed sequentially once a function is called. On that basis, parties may not need to rely on human auditors to verify that performance is adequate, as the execution of code triggers a state transition that is recorded on the ledger itself (alongside a timestamp). By reducing monitoring costs, the range of feasible contracts can be expanded, with attractive possibilities in the realm of financing.

2.2.6 Enforcement costs

In personal exchange, kinship ties, friendship, and personal loyalty constrain parties' behaviour. Insofar as parties do not feel the need to engage in negotiations, monitor, or...
seek protection from defaults, transaction costs will be reduced. Although the ease of forming personal relationships varies from one society to another, our cognitive capacity limits the scalability of these relationships.\textsuperscript{108} Transactional activity in developed economies is instead dominated by impersonal exchange, where 'social and moral shackles' may not suffice to deter a party from defaulting. As Hobbes observed in \textit{Leviathan}: "he that performeth first, has no assurance the other will perform after; because the bonds of words are too weak... without the fear of some coercive power".\textsuperscript{109}

The devil that Hobbes warned of is a master of disguise. In the transaction costs literature, this threat is represented by the notion of opportunism;\textsuperscript{110} in the new comparative economics, this falls within the scope of disorder;\textsuperscript{111} and in finance, it takes the form of counterparty risk. In turn, the 'prisoners dilemma' in game theory exemplifies how the absence of a credible commitment leads to an uncooperative, Pareto-inefficient equilibrium.\textsuperscript{112} Last, the notion of 'trust' is applied generously across the literature to describe relationships in which this threat has been mitigated.\textsuperscript{113} Yet, as Posner reminds us, "trust... is merely an imperfect substitute for information".\textsuperscript{114}

\textsuperscript{108} Szabo (n 75): “Without institutional and technological innovations of the past, participation in shared human endeavors would usually be limited to at most about 150 people – the famous ‘Dunbar number’. “ On societal trust, see Francis Fukuyama, \textit{Trust: The Social Virtues and the Creation of Prosperity} (The Free Press, 1996).

\textsuperscript{109} Leviathan or \textit{The Matter, Forme and Power of a Common-Wealth Ecclesiasticall and Civil} (Andrew Cooke, 1651) 105. See also Anthony T Kronman, ‘Contract Law and the State of Nature’ 1(1) \textit{Journal of Law, Economics and Organisation} 5-32, 10: “Where one of the parties is put in an asymmetrically disadvantageous position... where the exchange cannot be made perfectly simultaneously at every step... If the risk is great enough, it may kill the exchange entirely, even though both parties would be better off were it completed.”

\textsuperscript{110} See Oliver E Williamson, ‘Opportunism and its Critics’ (1993) 14 \textit{Managerial and Decision Economics} 97-107, 97: “Transaction cost economics has proposed that economic agents be described as opportunistic, where this contemplates self-interest seeking with guile.”


\textsuperscript{112} See Vili Lehdonvirta, ‘The blockchain paradox: Why distributed ledger technologies may do little to transform the economy’ (2016), available at the Oxford Internet Institute Blog. See also Rius (n 1).

\textsuperscript{113} There is a lack of agreement in the literature as to whether trust arises from formal or informal institutions, or perhaps both. See generally Bart Nooteboom, ‘Social capital, institutions and trust’ (2007) 65(1) \textit{Review of Social Economy} 29-53, 29: “These concepts are full of ambiguity and confusion”. From an economic perspective, see Jeffrey H Dyer and Wujin Chu, ‘The Role of Trustworthiness in Reducing Transaction Costs and Improving Performance: Empirical Evidence from the United States, Japan, and Korea’ (2003) 14(1) \textit{Organization Science} 57-68, 57: “[Trust is defined in the literature as] one party's confidence that the other party in the exchange relationship will not exploit its vulnerabilities... Trust in exchange relationships has been hypothesized to be a valuable economic asset because it is believed to (1) lower transaction costs and allow for greater flexibility to respond to changing market conditions... and (2) lead to superior information sharing which improves coordination and joint efforts to minimize inefficiencies.” From a computer law perspective, see Mason and Reiniger (n 49) 137.

\textsuperscript{114} Richard A Posner, ‘The Right of Privacy’ (1978) 12(3) \textit{Georgia Law Review} 393-422, 408. In the context of software, see William S Harbison, ‘Trusting in Computer Systems’ (University of
One way to mitigate this threat is to search for signals that convey a party's likelihood of default. Reputation systems can be a source of such signals, helping to reduce the scope of due diligence that parties need to conduct. However, reputation systems have their limits too. First, the reliability of these systems depends on how costly they are to game, for instance, by generating fake ratings or shifting to a new account. Second, they do not assist those who are new to the system (the 'chicken and egg' problem). Third, the prospect of repeat business may not deter a party from foregoing their reputation capital where the gain from defaulting has a higher expected value than continued performance (the 'last-period problem').

Legal institutions can exert a stronger and more pervasive form of credible commitment. Laws are enforced by the courts and backstopped by state agents' coercive powers. At the ex ante stage of contracting, the mere threat of enforcement can incentivise parties to perform. At the ex post stage, the courts provide finality to a dispute when a contractual breach or unforeseen event occurs. Within the courts' diverse toolkit is the ability to require the defaulting party to compensate the non-defaulting party (i.e. damages) or to order that the outstanding obligations be performed (i.e. specific performance). These contract law

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116 See generally Douglass C North, Institutions and Credible Commitment (1993) 149(1) Journal of Institutional and Theoretical Economics 11-23. See also Kenneth Shepsle, 'Discretion, Institutions, and the Problem of Government Commitment’ in P Bourdieu and K Coleman (eds), Social Theory for a Changing Society (Westview Press, 1991) 245-265, where the author notes that a commitment is credible in either of two senses, the motivational (incentive-compatible) or the imperative (coerced). On the latter, see Gans (n 104) 6: “Beyond such social forces, there have been institutional mechanisms that have developed to allow obligations to be performed sequentially”. Gillian K Hadfield, 'The Many Legal Institutions that Support Contractual Commitment' in Claude Menard and Mary Shirley (eds), Handbook of New Institutional Economics, (Kluwer Academic Publishers, 2004) 175–204. See also Riikka Koulu, Law, Technology and Dispute Resolution: The Privatisation of Coercion (Routledge, 2019): “The feedback system or multilateral trust marks may facilitate commerce and increase trust and even create better business practices, but in the end they are not the functional equivalent of engaging law's coercion. They follow a different rationality from the inherent violence of law.” See generally Douglass C North, John Joseph Wallis, and Barry R Weingast, Violence and Social Orders: A Conceptual Framework for Interpreting Human Recorded History (Cambridge University Press, 2013).

118 In civil law jurisdictions, the default remedy following a contractual breach is specific performance. In these jurisdictions, lawmakers place greater emphasis on the moral obligation to perform that is deemed to underly each legal obligation. In contrast, common law jurisdictions are more pragmatic, with damages being the default remedy. See Gregory Klass, ‘Efficient Breach’ in Gregory Klass, George Letsas, and Prince Saprai, Philosophical Foundations of Contract Law (Oxford University Press, 2014). See also Steven Shavell, ‘Why Breach of Contract May Not Be Immoral Given The Incompleteness of Contracts’ (2009) 107 Michigan Law Review 1569-1581.
principles may be overridden by equity considerations, insolvency laws, and other public policy concerns. Alternative dispute resolution is also a viable (and often more efficient) route to contractual enforcement, with decisions being made in the “shadow of the law”.¹¹⁹

For all of their virtues, legal systems are not without their fair share of warts. It is perhaps helpful to highlight a few prominent arguments from the literature. First, the litigation process can be costly and time-consuming; in other words, it can be skewed in favour of deep-pocketed parties.¹²⁰ As such, it may be economically inefficient for a party who has been wronged to litigate, particularly when small money claims are involved.¹²¹ Second, the law is not uniformly interpreted by lawyers or even judges, thereby giving rise to legal risk. Third, the rule of law is not upheld in all legal systems, giving rise to lobbying, corruption and discrimination.¹²² Fourth, even in systems where the rule of law is upheld, judges are not immune to biases, emotional swings or fatigue. An empirical study from Israel finds that "judicial rulings can be swayed by extraneous variables that should have no bearing on legal decisions".¹²³

Early smart contract advocates (including Szabo) saw in smart contracts an opportunity to sidestep the enforcement costs and injustices emanating from legal systems.¹²⁴ In an ideal setting, smart contracts would be fully automated, with the nodes preventing deviations from an intended state.¹²⁵ Even assuming that the code is bug-free, there will be situations in which parties might be better off by agreeing to deviate from the agreed terms, perhaps after

¹¹⁹ Robert H Mnookin and Lewis Kornhauser, ‘Bargaining in the Shadow of the Law: The Case of Divorce’ (1979) 88(5) Yale Law Journal 950-997. Koulu (n 117) observes that there is a feedback loop: the legal system either copes “with the irritation [posed by private enforcement] and improves its immune system by addressing such demands, or it ceases to exist.”


¹²¹ Even if parties succeed in their dispute, they will generally be unable to recover in full the legal fees incurred. In the context of English law, see the Civil Procedure Rules, Part 44.


¹²³ In Shai Danziger, Jonathan Levav, and Liora Avnaim-Pessö, ‘Extraneous factors in judicial decisions’ (2011) 108(17) Proceedings of the National Academy of Sciences 6889-6892, the authors analyse 1,112 judicial rulings in Israeli criminal law cases and identify that judges’ propensity to issue a favourable ruling decreases probabilistically on the basis of how close they are to their usual break (an observable proxy for fatigue). See also Oliver Wendell Holmes, The Common Law (Little, Brown and Company, 1881): “The life of the law has not been logic: it has been experience. The felt necessities of the time, the prevalent moral and political theories, intuitions of public policy, avowed or unconscious, even the prejudices which judges share with their fellow-men, have had a good deal more to do than the syllogism in determining the rules by which men should be governed.”

¹²⁴ Miller (n 58) argues that computer security systems are no different than good legal systems, insofar as they can each be characterised as “a neutral framework of rules that support cooperation without vulnerability”. In Ken Binmore, ‘Game Theory and Institutions’ (2010) 38(3) Journal of Comparative Economics 245-252, the author argues that the “fairness” of institutions reinforces their ability to withstand the sands of time.

¹²⁵ See Vitalik (n 35) 1 and Wood (n 35) 1.
acquiring some new information. As Raskin notes, if parties “tie themselves to the mast like Ulysses”, they will forego this form of optionality. Similarly, parties may prefer to defer the formulation of certain obligations to a later stage, relying in the interim on parties’ mutual interest in preserving an economic relation.

As argued in section 1.5, performance can typically only be automated in part, with the remainder requiring some form of manual input (and therefore human discretion). To mitigate opportunism in these cases, a smart contract can be programmed to facilitate certain forms of self-help. For instance, a party may be required to post collateral to a smart contract, which will cryptographically escrow the transferred assets. In the absence of a legal concept of ‘security interests’, this solution burdens the scalability of impersonal exchange. A number of more complex, game-theoretic mechanisms have also been proposed to mitigate the risk of opportunistic behaviour. The literature on bounded rationality and satisficing raises questions as to the extent to which these mechanisms might prove useful beyond the realm of economists’ fantasies.

The discussion in this section highlights the benefits of smart legal contracts, particularly in jurisdictions where the rule of law is substantially upheld. By adopting this transactional structure, parties can take advantage of the efficiency of code execution, while retaining the option to pursue legal enforcement when code malfunctions or a counterparty defaults. There are, however, practical challenges to this approach. The first is that, if parties are unable to identify one another, they will be unable to enforce obligations in court. Any commitment

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126 In Oliver E Williamson, The Economic Institutions of Capitalism (Free Press, 1985), this is referred to as “maladaptation”: when parties later discover that the most efficient course of action was not ‘A’, as defined ex ante in the contract, but ‘B’. The renegotiation that is likely to ensue can prove costly for both parties.

127 Max Raskin, ‘The Law and Legality of Smart Contracts’ (2017) 1 Georgetown Law Technology Review 305, 309. Werbach and Cornell (n 12) 356 suggest that smart contracts might be regarded as “specific performance on steroids and without the state’s coercive machinery.” In turn, Sklaroff (n 27) refers to the potential for maladaptation and the inability to exploit efficient breaches as the “cost of inflexibility”.


129 For other means of addressing this threat, including taking collateral, hostages, hands-tying and union, see Kronman (n 109) 11-24.

130 See, eg, Gans (n 104). See also Richard Holden and Anup Malani, ‘Can Blockchain Solve the Holdup Problem in Contracts?’ (University of Chicago Coase-Sandor Institute for Law & Economics Research Paper No. 846, 2017). On the emergent interdisciplinary field of “cryptoeconomics”, see Josh Start, ‘Making sense of cryptoeconomics’ (2017). In Cunningham (n 45) 244, the term “computationalism” is introduced to describe “a complete faith in the ability of mathematics and technology to eradicate problems emerging from human behaviour.”

131 See generally Jonathan Baron, ‘Heuristics and Biases’ in Eyal Zamir and Doron Teichman (eds), The Oxford Handbook of Behavioral Economics and Law (Oxford University Press, 2014). In ‘Small-game fallacies’ (2015), Szabo coins the term “small-game fallacy” to describe situations in which game theorists compress real world scenarios into a limited but workable set of assumptions, sacrificing a significant dose of relevance in the process. See also Nick Szabo, ‘Micropayments and Mental Transaction Costs’ (1999).
to a contract law system ceases to be credible, with parties operating within a regime of de facto *caveat emptor* (‘let the buyer beware’). I will consider the set of issues posed by pseudonymity in section 3.4. The second challenge is that of determining the applicable law and forum for the resolution of disputes. With regard to the former, common rules such as the Place of the Relevant Intermediary Approach (PRIMA) may not be particularly helpful when dealing with smart contracts, given that, by maintaining a copy of the ledger, every node in the network is effectively acting as an intermediary.\textsuperscript{132}

### 3. Design trade-offs

In the previous section, I focused on the comparative merits of traditional legal contracts and smart contracts. In this section, I wish to shift the attention to the related choice of medium of expression. While parts of the analysis may be transposed to algorithmic and hybrid contracts at large, I seek to account for the idiosyncrasies of DLT networks. In deciding where the ‘split’ between code and natural language should lie, I will apply the legal principles discussed in section 1 and reference the transaction costs framework from section 2.

#### 3.1 Bare smart contract code

The simplest form of smart contract is that which is comprised exclusively of code. An example might be an ICO smart contract that sets the economic terms for the issue of a new cryptoasset. In the absence of natural language, this contract is still capable of being legally binding, provided that it meets the threshold set by an applicable legal system. In common law systems, an intention to be legally bound is required, which in the case of token issuers might be a dubious assumption. Where that is the case, an ICO issuer who has received the purchaser’s funds would be legally obliged to cause new tokens to be issued to the purchaser. This is so even where an attack or other unforeseen event has led to an unintended state.

One of the main motivations in the use code is to avoid the semantic ambiguity, or 'open texture', of natural language.\textsuperscript{133} DLT networks are deterministic by design, meaning that the entries registered by the networked nodes in their local copies of the ledger are meant to be consistent. Similarly, smart contract code is executed by a deterministic process that does not concern itself with subjective or contextual considerations. On the other hand, programming languages are also living creatures, as their grammar is capable of evolving. In this regard, Ethereum’s most popular programming language (Solidity) is immature and poorly document.\textsuperscript{134} It is common for Solidity's predefined terms ('reserved values') to be deprecated

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\textsuperscript{132} As argued in Rius (n 1), far from facilitating disintermediation, DLT enables *superintermediation*, so that parties need not rely on a single record-keeper (or witness). At the expense of proposing an idealistic solution, it would perhaps be helpful for the challenge of determining applicable laws to be addressed through an international convention. The Hague PRIMA Convention was adopted on 13 December 2002.

\textsuperscript{133} In ‘Wet code and dry’ (2011), Nick Szabo draws a distinction between wet code (interpreted by humans) and dry code (interpreted by computers). Natural languages and law are mostly wet code, whereas smart contract code is dry code. I agree with Allen (n 14) 12 in that this terminology is not particularly helpful, particularly when considering the prevalent semantic chaos.

\textsuperscript{134} The documentation for the latest version of Solidity is available at <https://solidity.readthedocs.io/en/v0.6.10/>.
with frequency, imposing monitoring and learning cost on developers that will ultimately be borne by principals.

The DAO is perhaps a well-studied example of bare smart contract code, although natural language was used to set out certain rules that participants were expected to follow. An example of an application that is currently still functional is the Maker platform, which enables users to post ether (and other supported cryptoassets) as collateral for a ‘loan’ denominated in the platform’s stablecoin (DAI). There is a wealth of contradicting, outdated and fragmented documentation about the platform’s inner workings. It is clear from the disclaimers in these documents that contributors do not wish to be legally bound by its contents. In view of this, a court could take the view that DAO tokenholders and Maker users implicitly waived their rights under contract law. This does not, of course, prevent the application of criminal law, public law and perhaps even insolvency law to transactions effected in these platforms. In this regard, participants would benefit from greater legal clarity as to the circumstances in which the ‘algorithmic veil’ might be pierced by the courts.

A setting in which code alone may fall short is when referencing off-chain assets. There is a lot of interest in the practice of ‘tokenisation’, which involves the issuance of tokens that represent off-ledger assets, such as currencies (in the guise of ‘stablecoins’), commodities or securities. This gives rise to "mixed-economy risk", that is, the frictions in linking assets in the real economy (or financial markets) to on-ledger assets. Most users would not be satisfied if an issuer were to simply issue tokens on the premise that these are ‘fully backed’. An unconventional solution entails storing the underlying assets in a vault and constantly livestreaming the vault’s contents, thereby reducing monitoring costs. A perhaps more reliable solution involves the use of an external custody agreement that is linked to the smart contract code (a split contract), allowing tokenholders to enforce a legal claim against a named entity. The decision of whether to introduce a new (and faster) settlement layer for assets through tokenisation should factor in the costs involved in setting up and maintaining these legal structures, as one would expect these costs to be passed on to tokenholders. Alternatively (or in addition), operators might be compensated through the exercise of rights to re-use the underlying assets (e.g. through lending or rehypothecation), thereby reintroducing the counterparty risk that pervades traditional financial intermediation.

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135 See fn 45.
137 In Kim Kaivanto and Daniel Prince, ‘Risks and Transaction Costs of Distributed-Ledger Fintech Boundary Effects and Consequences’ (2017) arXiv:1702.08478 1-12, 6, the term “mixed-economy” is introduced to refer to the co-existence of fiat currencies and cryptocoins in given market. I wish to extend this concept to encompass any combination of on-ledger and off-ledger assets.
138 See Matt Levine, ‘Money Stuff’ (Bloomberg Opinion, 12 October 2018): “First of all, if someone does steal the gold [from Eidoo’s vault], on camera, while the token holders watch in increasing horror, that is going to be a really funny day on Twitter and Reddit... Second, if you buy these tokens... Are you going to sit at your computer 24 hours a day staring at a live feed of some motionless gold bars in a windowless room, muttering to yourself ‘yes the future of economics Is finally here?’”
139 On the topic of smart contracts and custody of off-ledger assets, see Mattereum, ‘Smart Property Registers’ (2019-2020).
When dealing with code alone, parties should consider the risk posed by bugs and attacks (code risk and cybersecurity risk, respectively). Several analyses of Ethereum smart contracts have revealed a concerning number of widespread vulnerabilities stemming from the immaturity of Solidity and related testing tools.\textsuperscript{140} To address this, developers can incorporate "escape hatches" that permit performance to be halted with parties' consent.\textsuperscript{141} A trade-off arises due to the increased complexity of the code, as these fallback mechanisms open the floodgates to unforeseen vulnerabilities and consequently expands the 'attack surface'.

Last, the use of natural language may be necessary to comply with legal formalities. For instance, there are certain signing and witnessing requirements for parties to a land transaction. In certain jurisdictions, land transactions may require parties to sign in the (physical) presence of a notary. The use of smart contract code to transfer interests in land may thus give rise to legal uncertainty. Nowadays, one could argue that parties can attain similar security assurances through the use of private keys, digital signatures and multisignature requirements. Further, all of the networked nodes can be said to act as 'witnesses', as the transaction will be recorded in their local copies of the ledger. Unfortunately, the law typically follows (and gives force to) transactional customs, and not vice versa. On that basis, these formalities might obstruct the exploration of efficiencies in this setting.\textsuperscript{142}

\textsuperscript{140} In Daniel Perez and Benjamin Livshits, ‘Smart Contract Vulnerabilities: Does Anyone Care?’ (2019) arXiv:1902.06710, the authors summarise the empirical research on smart contract vulnerabilities and dispel some misconceptions.

\textsuperscript{141} See fn 36.

\textsuperscript{142} In the UK, Her Majesty's Land Registry is exploring through its “Digital Street” project the use of DLT and smart contracts in maintaining and updating the country’s register of land property.
3.2 Natural language and code – no overlap

Certain contractual terms are not capable of being expressed in Boolean (or fuzzy) logic. Clack et al. refer to these as "non-operational" terms, in contrast to the "operational" logic that can indeed be compiled from natural language into code. Amongst these non-operational terms are standards of behaviour (e.g. 'reasonable' and 'in good faith') that seek to ameliorate issues of contractual incompleteness. In the event of litigation, the courts can ascribe meaning to these terms by reference to industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry standards or legal constructs such as industry 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as the reasonable person.\footnote{See Helow v Advocate General [2008] 1 WLR 2416 at 2417-2418 per Lord Hope: the reasonable man forms part of “the select group of personalities who inhabit our legal village and are available to be called upon when a problem arises that needs to be solved objectively.” See also Rius (n 1) and Allen (n 14) 23-24.} It is possible that advances in artificial intelligence might eventually enable software to make such subjective determinations.\footnote{See generally Harry Surden, ‘Machine Learning and Law’ (2014) 89(1) Washington Law Review 87-115. For a discussion of automation and reasonableness, see Ryan Abbott, ‘The Reasonable Computer: Disrupting the Paradigm of Tort Liability’ (2018) 86(1) George Washington Law Review 1-45.}

The use of natural language can remove the ambiguity stemming from the legal enforceability of bare smart contract code. In addition, by using natural language, parties’ true intentions are more likely to be correctly gauged by a judge or arbitrator, thereby helping to reduce enforcement costs. Arbitration systems are easier to implement in permissioned networks, as participants are identifiable and can coordinate more easily. Nonetheless, a number of arbitration systems have emerged in permissionless networks too; these can be purely code-based and reliant on non-specialised jurors (e.g. Kleros), or dependent on traditional, off-ledger arbitration (e.g. Mattereum).\footnote{For an analysis of different types of arbitration systems for smart contracts, see Darcy W E Allen, Aaron M Lane, and Marta Poblet, 'The Governance of Blockchain Dispute Resolution' (2020) 25 Harvard Negotiation Law Review 75-101.}

The following scenario illustrates the use of a hybrid contract comprised of non-overlapping natural language and code. Parties who wish to trade over-the-counter cryptoasset derivatives can do so under the umbrella of an ISDA Master Agreement, which will record operational terms of general applicability as well as the non-operational terms.\footnote{See Alfonso D M Rius and Eamonn Gashier, ‘On-Chain Options for Digital Assets’ (Conference Paper, Crypto Valley Conference on Blockchain Technology, 25 June 2019).} In turn, individual trades can be effected by sending the economic parameters of that trade (e.g. reference asset, margin, price source, and expiry) to a smart contract template. ISDA itself is exploring the use of split contracts to encode the operational logic in the derivatives lifecycle, thereby automating collateral transfers.\footnote{See ISDA and Linklaters (n 144). See also ISDA and KWM, ‘Practical Framework for Constructing Smart Derivatives Contracts’ (2018).}

The EOSIO network comprises another example of a non-overlapping use of natural language and smart contract code.\footnote{See Daniel Larimer et al, 'EOS Technical White Paper (2017-2018). The “EOS network” was subsequently rebranded as the “EOSIO network”. See also Ian Grigg, 'The Governed Blockchain' (2018).} This, however, operates at a ‘macro’ level across all network users and smart contracts. The network has a natural language constitution with non-operational clauses that have been ‘voted in’ by network users. By design, users include a hash of the constitution in every transaction that they send. Block.One, the promoters of the EOSIO network, intended for the constitution’s terms to be legally binding; as such, it even includes an arbitration provision.\footnote{See Article IX of the EOSIO Constitution (as of 29 March 2020), available at <https://github.com/EOSIO/eos/blob/5068823fbc8a8f7d29733309c0496438c339f7dc/constitutio>}

constitution's terms, which raises doubts as to their enforceability in court. Crucially, there is no overlap between code and natural language in this design; each medium is put to use where deemed most efficient.

3.3 Natural language and code – partial or complete overlap

Let’s return to our example of the ICO smart contract. In practice, this will often be accompanied by a ‘whitepaper’ that is written in natural language. In this document, the issuer will typically set out details on the team’s background, development goals and proposed use of funds. Often, the whitepaper will also include the economic terms on which the cryptoassets will be issued (e.g. at a fixed ether price with a total supply cap). There is, therefore, an overlap between the terms expressed in natural language and those set in the smart contract code.

By default, we would expect natural language to dominate to the extent that there is an overlap, since it is the more intelligible medium of expression. In this scenario, the natural language document would comprise the authoritative record, with the smart contract code being relegated to an execution mechanism for certain operational terms. If the parties are readily identifiable, the arbitrator or court could go on to enforce the terms set out in the natural language contract. This assumes, of course, that the parties intend to be legally bound by the natural language document. In this regard, the “LAO” model is an interesting response to the ambiguity created by previous DAOs. Here, a Ricardian contract ties a Delaware entity with limited liability to a web of smart contracts, which will be used to raise funds and vote on governance matters.\(^{152}\)

Parties need also consider the ease of reversing any unintended outcomes as a result of the code malfunctioning or a deliberate exploit. For instance, it is generally not possible to unwind transactions executed on a regulated trading venue, for instance, due to a ‘fat finger’. By doing so, we risk sending shockwaves down title and collateral chains, potentially giving rise to concerns of systemic instability. Without forking the ledger and causing disruption, it is generally not feasible to revert transactions if assets have been transferred to an account beyond the parties’ control. Permissioned networks are better equipped to address such issues, as parties might be able to identify one another and coordinate an orderly unwinding process.

Ricardian contracts are a prime candidate for this particular design. In these contracts, parties will insert the transaction-specific parameters into a natural language template. This document itself will be linked to a smart contract template, which will (automatically) be populated with the parameters provided. As such, the smart contract code will enforce at least part of the agreed obligations. Since this model relies on templates, it would not be well-suited to highly tailored transactions or those that are best structured through the use of an umbrella natural language agreement (as noted in the previous subsection).

\(^{n,md>\). For a legal analysis of the EOSIO Constitution, see Adam Sanitt, Norton Rose Fulbright, ‘Legal analysis of the governed blockchain’ (2018). See also Grigg (n 150).

3.4 The price of crypto-anarchy

In *The Crypto Anarchist Manifesto* (1988), Tim May proclaimed that cryptographic advances would soon enable transactions to be conducted in a truly private manner.\(^{153}\) Indeed, many of these cryptographic tools came to be implemented in DLT networks, with pseudonymity being the default configuration for participants. The use of pseudonyms does not in itself bar the creation of smart legal contracts, as the LTDP Statement reiterates in the context of English law.\(^{154}\) For example, transactions in financial markets are typically conducted in a pseudonymous manner, since parties wish to protect business-sensitive information and keep their views on the market private.

On the other hand, if parties cannot screen who – or what – they are facing, they may fall prey to adverse selection problems and other instances of opportunistic behaviour.\(^{155}\) In financial markets, this challenge is typically addressed by employing a chain of agents (such as brokers and clearinghouses) linked through intermediating contracts. These agents will conduct due diligence on their respective principals and enter into legally binding confidentiality obligations to safeguard the principals’ identity. As a result of adopting this structure, fees accumulate and are passed along the chain to the end-client. The settlement of transfers also takes time, as intermediaries must update their books in a sequential manner. Even transactions in the ‘spot market’ have deferred settlement (e.g. +2 business days for US equities), so counterparty risk is far from eliminated. The risk of default can be hedged by purchasing derivatives, though this should be considered as another form of transaction cost.\(^{156}\)

The Decentralised Finance (or ‘DeFi’) movement has recently gained traction, with many start-ups seeking to develop financial applications that eliminate the need for agents and settlement delays. For example, ‘atomic operations’ can be used to exchange assets in an all-or-nothing manner.\(^{157}\) However, challenges arise when dealing with assets that are recorded in different networks’ ledgers, since interoperability is currently underdeveloped.\(^{158}\) Further, settlement in permissionless networks is probabilistic, due to the possibility of chain

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\(^{153}\) Available at <https://www.activism.net/cypherpunk/crypto-anarchy.html>. In 1993, May’s ethos was echoed by Eric Hughes in ‘A Cypherpunk’s Manifesto’: “We the Cypherpunks are dedicated to building anonymous systems. We are defending our privacy with cryptography, with anonymous mail forwarding systems, with digital signatures, and with electronic money.”

\(^{154}\) LTDP (n 2) 37.


\(^{156}\) See generally Ian Grigg, ‘Seeking Consensus on Consensus: DPOS or Delegated Proof of Stake and the Two Generals Problem’ (2017): “[This challenge is] also known as the coordination problem. In blockchains we call it the consensus problem. In the financial cryptography world, it’s the double spend problem, and in databases, atomicity.”

reorganisations, hard forks and double-spending attacks. In addition, many financial transactions have a temporal element, so that no such atomicity is possible. In the context of lending, Maker addresses the risk of default by applying significant haircuts to the eligible collateral against which users can draw DAI. Since the collateral must withstand the volatility of cryptoassets, this results in very low loan-to-value ratios. Most DeFi applications are capital-intensive and therefore hard to scale, as they are unable to recreate the legal notion of security interests. As competition from established financial intermediaries increases, we would expect creditworthy parties to switch to these intermediaries.

The preceding analysis suggests that privacy, therefore, comes at a cost. To adequately protect themselves against counterparty risk, parties wishing to adopt a pseudonym must choose between two sets of ‘evils’: (1) reliance on risk-measuring intermediaries within the purview of the legal system, or (2) full collaterisation and a consequent drag on transactional scalability.

A potential response to this challenge would be to rely on reputation systems; indeed, this is the solution that May had in mind. However, reputation systems are subject to the issues identified in section 2.2.6. There is an additional challenge that DLT networks face: for parties to establish a track record, they must either re-use the same address or prove their ownership of various addresses. Either scenario creates a risk of identification through graph analysis, heuristics and clustering.

An alternative response involves the use of mechanism design to reshape the rules of the game, as well as relaxing the requirement for (permanent) pseudonymity. We can conceive of a system that is initially pseudonymous, yet a counterparty’s identity is disclosed if they default on performance. Disclosure under this system would be selective, so that only counterparties and, where applicable, the arbitrator or courts are able to identify the defaulting party. This selective disclosure increases the ease of legal enforcement, thereby reducing enforcement costs and facilitating impersonal exchange. Crucially, a party’s interests in preserving their privacy would, in itself, also operate ex ante as an incentive to...
perform. Insofar as this system requires a reliable authentication system for identity, it may currently be best suited to deployment in permissioned networks.

The upshot of this discussion is that, in structuring and analysing transactional activity, a sole focus on transaction costs would be myopic. Parties may be willing to trade-off economic efficiency in exchange for the protection of certain values, such as the right to privacy. At the same time, humans live in communities, and to facilitate individuals' pursuit of the good life, there are certain public interests are worth upholding. As Posner notes, there is a case for withholding the property right to privacy from a person where such right would allow them to get away with socially undesirable behaviour. A pertinent challenge stems from the variability of what amounts to socially undesirable behaviour, since this varies from one society to another, in contrast to the universal reach of DLT networks. Further, it would not be sensible to equate all such behaviour; for instance, we can distinguish between criminal activities and mere contractual defaults. The issue of where the line ought to be drawn depends on the extent to which disclosure is able to facilitate legal enforcement where desirable, as well as whether DLT users will be willing to embrace the perils of a caveat emptor regime.

4. Conclusion

The concept of a smart contract has a multidisciplinary underpinning, while its capabilities are evolving in line with technological advances. Parties may benefit from using smart contracts to reduce transaction costs by leveraging the efficiency of code executions. In choosing how to structure a transaction, parties should recognise that legal systems and DLT networks are not mutually exclusive (with smart legal contracts being a hybrid structure). Importantly, parties need also consider how the choice of medium of expression might impact transaction costs and the set of risks that they face. Further, parties who wish to transact pseudonymously in DLT networks may find that their dealings are necessarily capital-intensive and unscalable, as counterparty risk is heightened in a regime of de facto caveat emptor.

I would like to conclude by reflecting on the scope and motivations of this paper. I recognise that this is a fast-moving field and that some of the distinctions that I have drawn are razor-thin. Similarly, there are a number of ideas that have been introduced in passing and may merit further consideration. There are also related topics that I have not delved into, such as the governance of DLT networks, the organisational forms that smart contracts can enable, or the evolutionary aspects of DLT-enabled institutions. I encourage commentators to build on the shortfalls of this work, without losing sight of the multidisciplinary and tolerant approach that is advocated in this paper. It is through a

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165 Posner (n 114) 403.
168 See, eg, Darcy W E Allen, Chris Berg, Brendan Markey-Towler, Mikayla Novak, and Jason Potts, 'Blockchain and the evolution of institutional technologies: Implications for innovation policy' (2020) 49(1) Research Policy, article 103865.
collaborative process of doctrinal stress-testing, and creative destruction, that we may come closer to grasping the hidden order in human exchange.
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Dear Sir or Madam

Smart Contracts - Call for Evidence (December 2020)

We are grateful for the opportunity to respond to the call for evidence published by the Law Commission in December 2020 relating to smart contracts (the Call for Evidence).

Our response to selected questions from the Call for Evidence are set out in the appendix to this letter. Unless the context requires otherwise, our response adopts the definitions and abbreviations set out in the Call for Evidence.

By way of background, Allen & Overy LLP is a global law firm that helps the world’s leading businesses to grow, innovate and thrive. Given the nature of our work, our response mainly considers questions from a sophisticated commercial contract perspective.

As a general matter, we note that some of the potential issues raised in the Call for Evidence are most relevant where a smart contract is ‘solely code’ and/or there is no express agreement between the parties as to governing law and jurisdiction. For the foreseeable future in a commercial context, we expect such contracts to be in the minority. Commercial contracts are typically too nuanced to be reduced solely to code or otherwise include terms that are better suited to natural language than code. Even where it is feasible to document a term in code instead of natural language, there might not necessarily be a practical advantage in doing so. In terms of governing law and jurisdiction, for legal certainty, parties to commercial contracts will typically want an express agreement on these matters.

As the Call for Evidence and the UKJT Legal Statement both note, some (but not all) aspects of smart contracts do not raise novel considerations and are adequately catered for by the existing English legal framework (given its renowned flexibility and pragmatism). In those cases, we do not see a need to create a parallel set of rules, as that would create an unnecessary proliferation of rules. In other words, where possible, changes to the legal framework should be limited to where it is genuinely necessary. Where changes are required, a general aim should be promote neutrality of outcome as between a smart contract situation and its more traditional equivalent.
Given the scope of this Call for Evidence, we have not commented on matters such as financial regulation, data protection, intellectual property or taxation. However, we note that ensuring these areas are fit for purpose is necessary to promote the adoption of smart contracts in a widespread and robust manner.

We would be happy to discuss any aspects of our response in further detail with you - please contact ____ ___________________________________________________________ in the first instance.

Yours faithfully

Allen & Overy LLP
APPENDIX

Question 9.
In what ways can parties reach an agreement through their interactions on a distributed ledger?

In many circumstances, especially in a commercial context, we expect there to be clear natural language negotiations that make the identification of an agreement between the parties relatively straightforward. As noted in paragraph 3.4 of the Call for Evidence, in these circumstances, no novel legal considerations should arise.

In the other cases where there are no natural language negotiations, or any such negotiations are too limited to be determinative, we agree with the analysis in paragraphs set out in paragraphs 3.6 to 3.11 of the Call for Evidence and paragraphs 145 to 147 of the UKJT Legal Statement - interactions between parties on a distributed ledger are capable of giving rise to agreement for these purposes. The precise setting and conduct involved may be somewhat novel but, due to the flexibility of English law, the application of existing principles can adequately determine whether parties have reached an agreement for these purposes.

Question 11.
Do you consider that offer and acceptance can occur through the operation of autonomous computer programs deployed by the parties on a distributed ledger?

If so:

(1) in what circumstances?

(2) on what legal basis?

Yes, we consider this to be possible. The fact that one or both parties did not have advance knowledge of the exact terms of the bargain struck due to the ‘delegation’ to software should not, of itself, be a bar to finding an agreement.

By way of analogy, in sophisticated financial markets that operate without the use of smart contracts or DLT, rules-based software systems are sometimes created by parties to enter into trades with other market participants (who may themselves also acting be acting through their own rules-based software) - finding there not to be an agreement in a typical fact pattern would be contrary to market expectation and potentially disruptive.

The key test should be whether the parties held out the software as a mechanism for reaching agreement, as noted in paragraph 3.19 of the Call for Evidence. This is something that can be analysed using traditional legal approaches and, in some markets/contexts, may be relatively easy to decide. In some settings, although the specific offer and acceptance may have occurred through computer programs, there may be a separate, more general understanding communicated between the parties about the use of autonomous computer programs that supports one conclusion or the other.

We note that paragraph 3.19 of the Call for Evidence points to sources suggesting that the relevant software is not the agent of the party. As noted above, we do not consider an agency construct necessary to find an agreement in these circumstances. Furthermore, applying an agency construct sits uncomfortably with some of the general principles of agency – some examples not already raised in the Call for Evidence are as follows:
• An agency relationship is generally created by express or implied agreement of the principal and the agent (unless created by statute) and governed by the terms of that agreement. Where a party creates or procures a software system for deployment, there is no such agreement in this sense.

• Certain general rules that govern (i) the relationship between the principal and the agent and (ii) the relationship between the agent and third parties are premised on the agent being a distinct person.

To some degree, an analogy can be drawn to where a merchant sells goods through its website in a conventional internet setting – the website may be programmed with a high degree of rules-based automation but would not typically be viewed as the agent of the merchant; instead it may be better to consider the merchant as merely communicating through the website.

Question 12.
How common is it for parties to enter into smart contracts on a DLT system without knowing each other’s real identities and in what circumstances is this likely to arise?

In a sophisticated commercial contract context, this is not common at present. The desire to know counterparties to perform commercial diligence and the need in many sectors to perform anti-money laundering and other checks are contributing factors. These factors will persist even as technology improves and smart contract adoption increases. We leave other respondents to comment on the position in other contexts.

Question 14.
Are you aware of, or do you foresee, any difficulties in applying the law on consideration to smart contracts? If possible, please provide examples.

No. The existing law and approaches should suffice (including for contracts that are solely code, as suggested in paragraph 3.29 of the Call for Evidence). Some situations may of course be more difficult to analyse than others on the facts, but that is in principle no different to the traditional contract setting.

Question 15.
Are you aware of, or do you foresee, any difficulties in determining whether the parties to a smart contract have reached a certain and complete agreement? If possible, please provide examples.

No. As suggested in paragraph 3.32 of the Call for Evidence, the use of smart contracts in any given context rather than traditional practice should not, of itself, give rise to novel considerations in this regard.

Paragraph 3.32 of the Call for Evidence notes that, in a hybrid contract, there may be a conflict between the natural language terms and the coded terms. We agree this is possible and, while any traditional contract may have conflicting terms (particularly if long and complex), the risk of conflict may be higher in hybrid contracts if the individuals documenting their terms work in a more fragmented or modular manner, with fewer people able to consider all the terms at a sufficiently expert level to promote overarching consistency. However, even if this risk is higher, where such a conflict arises, it can be addressed applying established principles.
Question 16.

Are you aware of any instances where the parties to a smart contract have expressly agreed that they do not intend to create legal relations?

Not in the types of matters our firm routinely encounters (other than, of course, deliberate test environments set up by working groups or other interested market participants). However, we consider it possible for such an express agreement to be effective, as concluded at paragraph 3.45 of the Call for Evidence.

Question 17.

Do you foresee any difficulties in ascertaining whether parties intend to create legal relations when they transact with one another on a distributed ledger?

Not in the types of matters our firm would routinely encounter. Where there is an intention to create legal relations, this should be easily discernible from the facts. Equally, where there is no intention to create legal relations (e.g. in a test environment), we would expect the parties to make that clear.

Question 18.

Do you consider that source code could meet the definition of “writing” in the Interpretation Act 1978?

We agree with the analysis and conclusions of the UKJT Legal Statement. Source code (as distinct from object code) should be capable of meeting the definition of “writing” and the analogy to foreign languages in paragraph 164 of the UKJT Legal Statement is apt. Whilst not necessary, it may be helpful to make this explicit by way amendment to the Interpretation Act 1978 to put the point clearly beyond doubt. Object code, on the other hand, will typically not be human readable in the manner necessary to constitute “writing” for these purposes.

As noted earlier, we believe solely code contracts will be rare for the foreseeable future in a commercial contract context; there should therefore be some natural language terms that remain. The natural language terms will often be the more suitable place to house the terms that give rise to an “in writing” requirement, which lessens the need for debate – for example, a power of attorney must be granted by deed, and we would expect parties to document the grant of a power of attorney in natural language terms rather than code (to do otherwise would not seem to be feasible or advantageous).

Question 19.

Do you consider that parties can “sign” an agreement recorded solely in code?

If so:

(1) are you aware of technologies that are currently in use or under development to facilitate the signing of agreements recorded solely in code?

(2) please provide any examples from your experience of where the parties have signed an agreement recorded solely in code.

Yes, as a general rule. As stated in the Call for Evidence and the UKJT Legal Statement, what is important is whether the parties intended to authenticate the stated terms. Technologies such as the use of public key cryptography can achieve this – their very purpose is authentication.
We leave other respondents to comment on current technologies and prior experiences in a solely code context.

**Question 21.**

Are you aware of any cases in which parties have arranged for the terms of a deed to be performed by, or recorded in, computer code deployed on a distributed ledger?

As stated in our response to question 18, in many cases we would expect parties to record the specific terms necessitating a deed (e.g. a power of attorney) in natural language rather than code – in those cases, only performance of the terms by the code would be relevant (if performance by code is even feasible/practical, which will not always be the case).

The natural language documentation involved in a blockchain bond issuance or similar may include a deed and some of the obligations in that deed (such as payment of interest), whilst not terms that originally gave rise to the need for a deed, will be performed by code.

**Question 22.**

Do you consider that a deed recorded partly or wholly in code can satisfy the statutory formality requirements applicable to deeds and address the implications of the Mercury decision?

We welcome the Law Commission’s recommendation in its Electronic Execution of Documents Report (Law Com No 386) to review the law of deeds and, in March 2020, the government acceptance of that recommendation.

Based on the current law we consider it possible for the statutory formalities to be satisfied where a deed is recorded partly or wholly in code (although we note our response to question 18 that deeds (and, in fact, sophisticated commercial contracts generally) are less likely to be solely code).

In terms of witness requirements in particular, if the contract contains a natural language component, that component can be witnessed in the traditional manner. For a solely code contract, while a witness could, for example, affix a digital signature to the code, it seems at least prudent for parties to ensure this will be unambiguously treated by subsequent readers as intended to be the attestation of a witness – some form of explanation within the code to explain the purpose of the witness digital signature could address this (even if as non-code commentary inside an otherwise code file).

In terms of the addressing the implications of the *Mercury* decision, we consider this to be possible in principle in a partly or wholly code contract but, as noted above, a review of this area is welcome more generally.

**Question 23.**

Are you aware of, or do you foresee, any difficulties in applying the principles of interpretation to identify whether terms of a particular smart contract are contained in the natural language component or the coded component of the smart contract, or both?

In most cases the natural language component should make the position explicitly clear, particularly for complex commercial contracts.

We recognise, however, that this may not always be the case. Where there is doubt, the existing principles of interpretation should suffice to resolve the point despite the nature of the facts being, in some sense, novel by comparison. As suggested in paragraph 4.8 of the Call for Evidence, considering whether or not the natural
language component would only make a complete agreement with the coded terms is likely to be helpful in this regard.

Question 24.

In what circumstances might disputes arise about the proper interpretation of the coded terms of a smart contract? Please provide examples where possible.

As discussed in paragraphs 150-151 of the UKJT Legal Statement, code is, by its very nature, much less prone to ambiguity and the possibility of multiple interpretations when examined on its face. However disputes about the proper interpretation may still arise.

The code may perform differently to how one or both parties had expected. This could be, for example, due to:

- a party not fully reading and/or understanding the code;
- a misunderstanding between a party and a coder appointed by that party to assist with the formulation of the code, such that the code did not reflect the intentions of that party;
- a ‘bug’ or other error or ambiguity in the code that remains undetected until after the contract is entered into; or
- the code not catering for all possible post-contracting eventualities and therefore being silent or ambiguous as to the treatment of an unexpected event that arises.

The concepts like mistake, rectification and frustration that such examples could invoke are covered in later questions. These examples of course are, in a sense, not particularly removed from what the courts are already used to dealing with on a daily basis.

Question 25.

Do you consider that the meaning of a coded term of a smart contract would or should be determined by asking what the term would mean to a:

(1) reasonable person;

(2) reasonable person with knowledge of the relevant code; or

(3) functioning computer?

It should be determined by a reasonable person with knowledge of the relevant code. This strikes the right balance and is the most consistent with the general principles of interpretation adopted by the English courts to date.

A reasonable person might not even understand code whatsoever, so adopting the first option would not be feasible to give proper efficacy to the coded terms of a smart contract.

At the other end of the spectrum, adopting the meaning to a functioning computer is too rigid – code is not necessarily infallible (as noted in our response to question 24) and there needs to be some flexibility to ensure the correct outcome is reached. Parties already take on an element of uncertainty of interpretation when entering into natural language contracts (even where efforts are made to mitigate this through careful drafting).
so we do not expect there to be significant concerns with this continuing to be the case with coded terms (albeit the uncertainty may be lessened given code may give less rise to debate as to meaning in the first place).

The proper interpretation approach in these circumstances may need to be framed more clearly through evolution of the common law over time.

**Question 27.**

*What practical or procedural steps could the courts take to resolve disputes about the interpretation of the coded terms of a smart contract?*

The existing practical or procedural steps open to courts in a more traditional setting should suffice. See also our responses above and paragraphs 4.23 to 4.29 of the Call for Evidence dealing with the use of expert evidence and assessors.

**Question 28.**

*Are parties utilising natural language in smart contracts to make their intentions clear in respect of any coded terms or the contract as a whole?*

In a commercial contract context where the parties are legally advised, yes the position should be clearly recorded in natural language.

**Question 29.**

*In what (if any) circumstances should courts be able to consider evidence of the parties’ pre-contractual negotiations as an aid to interpretation of the coded terms of a smart contract?*

In a traditional contract setting, consideration of pre-contractual negotiations should be limited for the reasons given in paragraph 4.41 of the Call for the Evidence. The same principles (as set out in, for the example, *Chartbrook Homes Ltd v Persimmon Homes Ltd* [2009] UKHL 38) should apply to coded terms. This would (i) help strike the right balance, (ii) be consistent with the approach of the English courts to date in a traditional contract setting and (iii) prevent an unnecessary parallel system of interpretation.

**Question 30.**

*Do you consider that the courts’ current approach to contractual interpretation might cause problems in the context of smart contracts?*

If so:

(1) *Can you provide examples or specific evidence of this occurring?*

(2) *What could be done to solve these problems?*

No – while the setting may be somewhat novel, the current approach of the courts remains fit for purpose. Please see our earlier responses.
Question 31.

Are you aware of, or do you foresee, any practical difficulties in ordering rectification of the coded terms of a smart contract? If so, do you think that parties to a smart contract will, in practice, seek rectification?

Rectification may be not possible from a technical standpoint in terms of correcting the originally recorded terms, in particular in the context of a permissionless blockchain as noted in paragraph 5.23 of the Call for Evidence; the immutable nature and lack of a central administrator prevents this. While permissioned blockchains with central administration and an in-built mechanism to amend recorded terms will no doubt be widely used, permissionless blockchains will be encountered by the courts as well.

As stated in paragraph 5.23 of the Call for Evidence, where rectification of the originally recorded terms is not possible from a technological standpoint, deployment of new code to arrive at the same practical outcome may be possible. At first blush, the distinction seems more of a technicality. However, it is worth ensuring any alternative process is, as far as possible, neutral for the parties compared to traditional rectification ordered by the court. From a regulatory, contractual, tax or accounting perspective, for example, a different treatment dependent would be undesirable and arbitrary. From a practical perspective, assuming the original code is left to perform, it may cause inconvenience for the parties (e.g. mistaken payments are still made under the old code such that the new code not only needs to reverse those but also provide for the correct replacement payments) – this is not something that may necessarily be addressed but we note it here for completeness. On a similar note, deployment of new code could reduce the automaticity and increase the credit and operational risk of the contractual relationship in practice compared to a single consolidated arrangement – for example, if the only feasible way to reach the correct outcome within the confines of technical limitations is for one party to continue receiving excess payments or deliveries through the original code and then manually rebate amounts to the replacement code for processing or directly to the transferor.

Rectification is not a commonly sought remedy of course, so the above issues should be considered in that light. Furthermore, parties that are concerned with being locked into a long-term contract without the possibility of future modification or correction may embed a ‘kill switch’ in the terms to neutralise automatic performance if that is seen as a lesser evil to an overly rigid set of recorded terms – such mechanisms could be used to mitigate some of the issues raised above.

Question 32.

Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether the parties have made a common mistake when entering into a smart contract?

No, in terms of determining whether a common mistake was made when entering into a smart contract the existing law suffices.

If a common mistake exists and a contract is void, there may be practical issues with nullifying the automatic performance of code but that is of course a distinct matter addressed by other questions.

Question 34.

Do you consider that the legal principles concerning unilateral mistake might need to be adapted to accommodate smart contracts concluded by computer programs without human intervention?

In particular:

(1) is it appropriate to confine a unilateral mistake to a mistake about a term of the contract?
What test should the court apply in determining whether the non-mistaken party had knowledge of the mistaken party’s mistake?

We consider the existing scope of the unilateral mistake under English law (as distinct from the wider Singapore law approach described in paragraph 5.54) to be sufficient.

Algorithmic trading in global financial markets is now prevalent and give rises to a similar fact pattern to the one in paragraph 5.50 of the Call for Evidence – i.e. contracts formed where one or both parties entered into the contract through a computer program without human intervention. The history of these markets to date has not suggested a change in the doctrine of unilateral mistake is needed to allow them to flourish or operate in a robust manner. Widening the scope of the doctrine would appear to add more drawbacks (in the form of uncertainty) than practical benefits.

We also note that the current position effectively allocates the risk of error or other deficiency in a computer program to the party that chooses to deploy it on its behalf in the markets, which is appropriate.

Question 35.

Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether a smart contract has been entered into as a result of a misrepresentation?

We agree with the suggestion in paragraph 5.61 that no novel legal issues arise in this context. The existing law can be applied.

Question 36.

Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning rescission to smart contracts which have been vitiated for misrepresentation, duress or undue influence?

Given the ‘practical justice’ approach described in paragraphs 5.75 of the Call for Evidence, the correct outcome should be achievable in many cases (including through use of the example steps in paragraph 5.76 of the Call for Evidence).

The main residual concerns are similar to those described in our response to question 31 above. For example, if there is immutable code with automated performance that cannot be nullified, the best available practical justice may involve a more complex or inconvenient set of remedial arrangements than in a traditional setting.

Question 37.

Are you aware of, or do you foresee, any difficulties in awarding damages for breach of contract where the terms of a natural language contract are performed automatically by computer code?

No.

Question 38.

Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning termination where the terms of a natural language contract are performed automatically by computer code?
The practical difficulties are similar to those described in our responses to question 36 above concerning rescission.

**Question 39.**

*Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning breach of contract to contracts recorded wholly or partly in computer code?*

We presume this question is limited to breaches of terms that are solely code, even if the broader contract is a hybrid one.

This question, and the two alternative approaches set out in paragraphs 5.99 to 5.102 of the Call for Evidence, are linked to question 25. In our response to question 25, we considered the meaning of a coded term should be determined by asking what the term would mean to a reasonable person with knowledge of the relevant code, which accords with the approach set out in paragraph 5.102 of the Call for Evidence and, once an interpretation of the term is settled, there should be no novel issues as far as breach of contract is concerned.

**Question 40.**

*Are you aware of, or do you foresee, any difficulties in applying the law on frustration to smart contracts?*

No, not in principle.

Where smart contracts are replacing traditional contracts that customarily address the relevant occurrences (for example through a force majeure provision), we would expect that practice to be preserved in the smart contract context (in natural language that applies to any coded terms as well if the smart contract is a hybrid contract), which will help lower the need to tackle the law on frustration in a smart contract context.

Where the law of frustration is brought into play, however, the existing principles and approaches should suffice. The examples in paragraph 5.109 have their analogues in the traditional setting. Systems breakdowns are a common risk for performance traditional contracts even though they are not deployed on a DLT. External data sources (such as interest rate benchmarks) are commonly referenced in contracts (which can be viewed as similar to oracles in a smart contract context) and parties are used to making a judgement call as to whether to spend the time prescribing for exceptional events or otherwise leaving the contract silent.

We note that on a private blockchain where there is a contractual relationship between each blockchain participant and the operator or similar of the blockchain and the issue at hand is a shutdown of the blockchain system itself, each participant may have recourse to the blockchain operator (or the law on frustration may also need to be applied to that distinct relationship).

**Question 42.**

*Are you aware of, or do you foresee, any difficulties in applying the illegality doctrine to claims made in relation to smart contracts?*

As noted in paragraph 5.115 of the Call for Evidence, the possibility for anonymous contracting and automated performance can be an increased challenge in detecting and, once detected, halting illegal activity. Ensuring robust criminal laws and anti-money laundering requirements, for example, that are not undermined over time by technological change should prevent this being a heightened issue in the types of commercial contracts on which we regularly advise.
Where there is illegality, the doctrine of illegality concerns the courts not helping to *enforce* a cause of action, so in a sense the real difference brought about by smart contracts is that the assistance of the courts may be less needed in general if performance is (irrevocably) automatic. If a court is, however, asked to help enforce a cause of action relating to conduct that is illegal in a smart contract context, the current doctrine as laid out in cases such as *Patel v Mirza* can be applied and no specific modification seems necessary to accommodate smart contracts.

**Question 47.**

Are you aware of, or do you foresee, any difficulties in identifying the place of formation of a smart contract?

As the Call for Evidence states, as a matter of English law, contracts are generally found to have been formed at the moment when, and in the place that, acceptance is communicated to the offeror (assuming the other necessary conditions for contractual formation are met). As such, a contract is made in England if the offeree’s acceptance is received by the offeror in England. Assuming the other necessary conditions are met, it should be possible to obtain permission to serve English proceedings in relation to such a contract out of the jurisdiction under Practice Directive 6B, para 3.1(6)(a). Our views on the utility of this rule in the context of smart contracts are as follows:

1. Before determining where (geographically) a contract is formed, it is first necessary to determine which acts or documents form or evidence the purported contract – in other words, what and where is the contract? This is discussed elsewhere in the Call for Evidence and our responses above.

2. We agree that, where the contract itself is in a natural language and is formed off the distributed ledger (such that there is no “smart” formation of the contract, even if there may be “smart” performance), there should be no greater difficulty in establishing whether the English courts have prima facie jurisdiction under para 3.1(6)(a) than would be the case in respect of any other natural language contract.

3. Where a contract is accepted by a party’s interaction with code (as in the example at paragraph 7.22 of the Call for Evidence, where an offer is made by Alice to the world and is accepted by Bob interacting with the code), we can see that particular uncertainties may arise. For example, it is conceivable that Bob’s acceptance is never communicated to Alice if performance is entirely automated. In circumstances where acceptance is communicated to Alice, however, it should be possible to identify where Alice was located at the time of the communication of that acceptance (or at least no less difficult than where acceptance may be communicated by email). Following *Entores v Miles Far East Corporation* ([1955] 2 QB 327), a contract made by “instantaneous” communication (for example email) will be made where the acceptance is communicated to the offeror, ie at the place where the acceptance is received. (In this case, the claimant in London made an offer by telex to agents of the New York based respondents. The agents were in Holland. The offer was accepted by a communication received on the claimant’s telex machine in London. The contract was found to have been formed in London.)

4. Where a contract is formed by the autonomous interaction of two computer programs (as in the example in paragraph 7.23 of the Call for Evidence) the position is arguably no different, provided it is possible to determine which of the two programs made the offer, although again uncertainties may arise in circumstances where acceptance is never communicated to the offeror.

5. Where hybrid smart contracts are concerned, we do not consider the position to be any different. By focusing on the location of the offeror, which will be a single place, it will not be necessary to consider other factors such as whether certain parts of the contract were formed via nodes and others via natural language, potentially in different places.
6. We can see that other difficulties may arise when seeking to determine the place of performance of a smart contract, For example:

   (a) there may be cases where it is not possible for a potential claimant to determine where a contract was made because it may not be apparent where the offeror was based at the time of accepting an offer.

   (b) the position may be particularly complex when dealing with multi-party, heavily negotiated contracts, where it may be unclear which party or group of parties is offeror and which party or group of parties is offeree.

7. We note also that the existing rules are somewhat arbitrary when applied to smart contracts and might, for example, confer jurisdiction on the English courts in circumstances where the smart contract and the parties have almost nothing to do with England (for example, if Alice happened to be present in England on holiday when accepting the offer).

8. Most of the issues identified in paragraphs 6 and 7 above are also issues in relation to non-smart contracts.

9. Given these difficulties, we can see there may be room to reform the way in which Practice Directive 6B, para 3.1(6)(a) operates, but in our view this reform should apply not only to smart contracts but also to other agreements concluded by electronic means. We see no reason why, in this context, special rules on the place of formation should apply only to smart contracts. We note the in this regard:

   (a) The comments by the High Court in Eurasia Sports Limited v Lan-Chun Tsai [2016] EWHC 2207 (QB) in this regard, where the judge commented in relation to para 3.1(6)(a) when trying to ascertain if an offer accepted on a telephone was accepted while the person in question was in the UK, that “It seems slightly absurd that the gateway should depend upon such a very fine distinction”.

   (b) The statement in Dicey (Dicey, Morris & Collins on the Conflict of Laws 15th Ed., paragraph 11-181, footnote 510) that for email the place of receipt is a concept by no means free from difficulty and the reference to the decision of the High Court of Australian in Dow Jones & Co Inc v Gutnick [2002] HCA 56 where the court had to grapple with defamation on the Internet: “Rules should be technology-neutral; Whilst the Internet does indeed present many novel technological features, it also shares many characteristics with earlier technologies that have rapidly expanded the speed and quantity of information distribution throughout the world. I refer to newspapers distributed (and sometimes printed) internationally; syndicated telegraph and wire reports of news and opinion; newsreels and film distributed internationally; newspaper articles and photographs reproduced instantaneously by international telefacsimile; radio, including shortwave radio; syndicated television programmes; motion pictures; videos and digitalised images; television transmission; and cable television and satellite broadcasting. Generally speaking, it is undesirable to express a rule of the common law in terms of a particular technology. Doing so presents problems where that technology is itself overtaken by fresh developments. It can scarcely be supposed that the full potential of the Internet has yet been realised. The next phase in the global distribution of information cannot be predicted. A legal rule expressed in terms of the Internet might very soon be out of date.”

10. Finally, in our experience, parties do not commonly rely on Practice Directive 6B, para 3.1(6)(a) to establish the jurisdiction of the English courts. This anecdotal view seems to be supported by the relative absence of case law in this area. It may be, therefore, that the reform of this rule should not be at the top of the priority list.
Question 48.
In what circumstances do you think that jurisdiction to hear a dispute in relation to a smart contract could be based on the actions and location of an agent?

We agree that two computer programs who autonomously reach an agreement could not be said to have acted as the parties’ agents. There is therefore no need to consider the circumstances in which jurisdiction could be based on the actions and location of an agent when dealing with contracts concluded autonomously by computers.

Beyond that, to the extent that a coder could in appropriate circumstances be considered to be an agent of the contracting parties, the general rule set out in CPR 6 PD 6B para 3.1(6)(b) should apply. In other words it should be possible to establish the prima facie jurisdiction of the English courts over claims in respect of a contract where the contract “was made by or through an agent [for these purposes a coder] trading or residing within the jurisdiction.” We can see no reason why a special rule should apply in relation to this type of agency.

Question 49.
Do you think that a rejection of state law in favour of the rules contained in the platform’s protocol is or should be a choice that can be given effect to under article 3(1) of the Rome I Regulation?

We agree that smart contracts can embody contractual obligations, provided the necessary criteria for contractual formation have been met and that, accordingly, the law applicable to such obligations will be determined by the Rome I Regulation as it forms part of English law under the European Union (Withdrawal) Act 2018 (UK Rome I).

We also agree that Article 3(1) of UK Rome I will only validate a choice of a national legal system and not a choice of non-State rules. In other words, a rejection of state law in favour of the rules contained in the platform’s protocol is not a choice that can be given effect to under Article 3(1) of UK Rome I. That is not to say, however, that non-state rules (for example the protocol of a DLT platform) could not be applied to a smart contract. An agreement to apply such rules could in our view amount to an incorporation by reference of those rules into the contract (in the same way as parties might incorporate Shari’a rules into their contract). The contract would still be governed by the law of a State, which will be the law chosen by the parties (if such a choice has been made) or, in the absence of such a choice, the law applicable pursuant to the rules set out in Article 4 of UK Rome I.

We do not believe that a rejection of state law in favour of the rules contained in a platform’s protocol should be a choice that can be given effect to under Article 3(1) of UK Rome I. The main reason for that is that the rules contained in a platform’s protocol are highly unlikely to set out comprehensively or with sufficient precision the rules that will govern the entirety of the relationship between the parties to the relevant smart contract. For example, there may not be express provision in the protocol for what happens if performance becomes impossible or illegal or if the parties have entered into the contract on the basis of a mistake. There may also be no provision for the consequences of breach. In our view smart contracts cannot exist in a legal vacuum. A State law will therefore always be necessary to fill the gaps.

We note that this section of the Consultation paper refers to scenarios where there are coded obligations without a natural language counterpart and states that, in those scenarios, the code is itself is the source of the contractual obligation. We agree. We do not see that an inability to (easily) understand the code should be a bar to the code being the source of a contractual obligation. See, by analogy:

- *L'Estrange v Graucob* [1934] 2 KB 394 where Scrutton LJ said that in the case of an agreement signed by a party “it is wholly immaterial whether he has read the document or not.”

- *Coys of Kensington Automobiles Ltd v Pugliese* [2011] EWHC 655 (QB) which concerned an auction conducted in Monaco and a contract in the English language, containing an express choice of English
law as the applicable law and an English jurisdiction clause. The defendant, an Italian national, claimed she was not bound by the jurisdiction clause since she did not understand English. The court held that she had understood enough of the form to be able to fill in the lot number and the description of the goods and, in general, a party who completed and signed a document could not rely on the fact that s/he had neither read nor understood it (L'Estrange v Graucob Ltd [1934] 2 K.B. 394 applied and Geier (otherwise Braun) v Kujawa, Weston and Warne Bros (Transport) [1970] 1 Lloyd's Rep. 364, [1970] 1 WLUK 391 considered).

- Barclays Bank Plc v Schwartz The Times, 2 August 1995 where Schwartz claimed that, because he was born in Romania and his understanding of English was very poor, he was entitled to have certain guarantees set aside. The court held, dismissing the application, that illiteracy could not be equated with mental incapacity or drunkenness, either of which could form a defence to a claim in contract, because someone who was illiterate was aware that he did not understand a transaction. Illiteracy could not, therefore, form a defence, even if the other contracting party was aware of it.

We would note, however, that notwithstanding the decision in Coys of Kensington, the threshold for establishing consensus as to a choice of jurisdiction in particular may be more difficult to meet if the parties did not understand what it was they were agreeing to.

**Question 50.**

*Can an express choice of applicable law be embodied in computer code? If possible, please provide any practical examples of a coded clause expressing a choice of applicable law.*

We agree that if parties agree upon a governing law and express this choice in a natural language element of a smart contract, this is unlikely to pose any particular problems for the choice of court rules in UK Rome I.

We note the Call for Evidence states that the position might be different in relation to an encoded governing law clause, that it has been suggested that a choice of law can hardly be represented in code and that if this is right, an entirely coded smart contract may not be able to contain express choices as to applicable law. We would make the following points in this regard:

1. We agree that it would appear not to be meaningful to purport to express a choice of law solely in code. A choice of law is not an instruction to execute a particular operation. However, we can see that within a closed, permissioned system, a choice of law could be represented in code (eg x = English law, y = French law) so as to enable two computer programs to interact autonomously and identify matching choices of law made by an offeror and offeree (x and x), with a view to contracting autonomously under the chosen law. This is, however, far removed from a scenario where the two computer programs are able to perform the resulting contract autonomously or indeed respond to a failure to perform (assuming there are scenarios in which there can be a failure to perform where that performance is autonomous) in a way that is informed by the choice of law.

2. If a choice of law cannot be encoded, the English court will apply the rules in Art 4(1) of UK Rome I to determine which law applies to the contract (see our answer to question 51 in this regard). However, reliance on these rules may well be highly unattractive and unsatisfactory to contracting parties. This could significantly reduce the attractiveness to commercial parties of contracting entirely in code.

3. This issue is not unique to governing law clauses. There are many other standard contractual provisions that are not simply instructions to execute particular operations. It is unclear how parties could meaningfully express any provisions of this type entirely in code. Examples might include provisions dealing with abstract legal concepts or obligations requiring the exercise of judgment (for example agreements on choice of court or obligations to act reasonably or in good faith). Whilst it may be possible to use computer code to represent such clauses, a computer could not meaningfully execute the obligations they entail.
Question 51.

What factors are capable of connecting a smart contract to a particular jurisdiction, for the purposes of article 4(3) and 4(4) of the Rome I Regulation?

We agree that, other than in cases where it may be difficult to identify a contracting party to a smart contract, the rules in Article 4(1) of UK Rome I should not pose any greater problems in relation to smart contracts than in relation to other, more traditional contracts. Nor can we see any reason why such rules are inappropriate in the context of smart contracts.

We also see no unique difficulty in relation to the application of Article 4(2) (which requires identification of the characteristic performer) to smart contracts. In the example set out in paragraph 7.52 of the Call for Evidence, we agree that Alice should be regarded as the characteristic performer of the smart contract. Alice is the legal person who entered into the contract. The program, as English law currently stands, is not a legal person capable of contracting and is, in effect, simply executing Alice’s instructions.

In relation to Article 4(3) (which allows the law applicable under Articles 4(1) and 4(2) to be displaced if the contract is manifestly more closely connected with some other jurisdiction) and Article 4(4) (which requires identification of the law with which the contract is “most closely connected”), many of the factors that are capable of connecting a smart contract to a particular jurisdiction are likely to be the same as the factors that connect non-smart contracts to a particular jurisdiction. So, for example, we would expect connecting factors to include:

(a) the location of the parties (Alice and Bob);

(b) the law governing any closely related contracts; and

(c) the place of performance of the smart contract (assuming there are some real world performance obligations, even the obligation is simply a payment obligation - we can see that there may be more difficulty in ascertaining the place of performance where performance is entirely autonomous and entirely virtual).

We recognise that there are other connecting factors that might be relied upon in relation to non-smart contracts to establish a connection with a particular governing law that may be inapplicable to smart contracts. The language of the contract is one such factor (at least where a contract is entirely encoded). We can also see that there may be scenarios where certain factors that would traditionally connect a contract with a particular jurisdiction are more difficult to identify, for example where there is no physical place of performance or where the smart contract is connected to multiple jurisdictions.

As for novel connecting factors, we do not see any particular merit in identifying these at this stage. As stated in Plender & Wilderspin, The European Private International Law of Obligations (5th Ed) “…where there is no characteristic or dominant performance, it may be impossible to formulate rules of thumb as to what factors a court should take into account or give predominant weight to. It will simply need to take account of all factors that it considers relevant and weight them as seems appropriate to the circumstances of the case.”

In relation to smart contracts on a distributed ledger the location of the majority of the nodes of the system in question may well be entirely arbitrary. Accordingly, our view is that in most cases this should not be regarded as a significant connecting factor.

In relation to Article 4(3) of UK Rome I, we do not see any particular difficulty in concluding in any case that there is no jurisdiction with which a smart contract is manifestly more closely connected. The word “manifestly” is key here. If a smart contract is connected with many jurisdictions or none, then it is appropriate that Article 4(3) does not apply to displace the law that would otherwise apply under Articles 4(1) or 4(2). The
position in relation to Article 4(4) is more complex. We can see that there may be scenarios where it is not possible to determine the applicable law pursuant to Articles 4(1) and 4(2) and also difficult to identify the law with which the contract is most closely connected. In most cases we would expect that an English court would take a pragmatic view and find that there is one jurisdiction where the preponderance of connecting factors are located, even if the balance is tipped only very narrowly in favour of that jurisdiction.

**Question 53.**

*Do you think that a rule of jurisdiction based on the place of contractual performance can be applied where the performance takes place on a distributed ledger?*

We agree with Dickinson’s view that it can be difficult to map jurisdictional rules which rely on territorial connecting factors onto legal relationships dealing with intangible property or that are conducted in a virtual environment. However, this issue is not limited to smart contracts. And it can apply equally to governing law rules as discussed above.

We also agree that there should be no particular difficulty in relation to smart contracts for the sale and purchase of goods or the provision of services or for other forms of real world performance.

We can see that there may be scenarios where ascertaining the place of performance may be factually challenging and where there may be an arbitrariness in ascribing what is essentially an artificial place of performance. The location of participating nodes would be a particularly clear example of that.

As to whether an alternative connecting factor should be identified, we can conceivably be some merit in this, although we would not expect such an alternative rule to apply only to smart contracts. This may be something to consider as part of any wider reform of Practice Direction 6B, particularly if the UK is not permitted to participate in the Lugano Convention such that the rules in Practice Direction 6B continue to be the primary basis for establishing the jurisdiction of the English courts.

**Question 54.**

*What factors do you think are capable of connecting a claim in relation to a smart contract to a particular jurisdiction?*

We agree that the factors listed in paragraph 7.82 of the Call for Evidence are appropriate factors to consider in the context of any *forum conveniens* assessment (and that in some cases there may be difficulties in identifying the appropriate jurisdiction).

**Question 55.**

*Which, if any, rules for establishing jurisdiction do you consider will be most problematic in the smart contracts context? Do you agree with our analysis of the issues as described in this call for evidence?*

Please refer to our earlier responses.

**Question 56.**

*Are there any issues we should be considering on smart contracts beyond those we discuss and ask about in this call for evidence?*
As noted in the introduction to our letter, financial regulation, data protection, intellectual property and taxation are examples of areas that are also key.

**Question 57.**

*Which other jurisdictions should we look to for their approach to smart contracts, and why?*

This is a nascent area globally and does not have the level of international coordination present in areas such as anti-money laundering or financial regulation. The level of activity and progress from country to country is varied and, where present, often domestically focused.

A small number of countries, such as Switzerland, Singapore and China, have demonstrated a level of proactivity and focus on smart contracts and related areas (such as cryptoassets and DLT more generally) markedly higher than that of other countries, including through initial regulatory and legislative change. Developments in these countries are worth monitoring to spot worthwhile ideas and learn lessons.

Developments in the United States and at the European Union level are of course should be monitored going forward – although they are not leading the way in terms of change for now, they are far too important to ignore.

**Question 58.**

*Are there any legal reforms that you consider immediately necessary to remove uncertainty and unlock some of the potential benefits and cost savings of smart contracts?*

No, not in terms of the issues specifically explored in the Call for Evidence. As noted in our responses, in many instances English law is already fit for purpose and eliminating any residual uncertainties ‘immediately’ would not unlock widespread adoption of smart contracts, as there are still a number of other factors that need to align such as the state of technology, market awareness and clarity on data protection matters.
Chapter 7: Jurisdiction and smart contracts

Question 47

Please share your views below:

A recurring challenge of international relationships is the differing legal approaches that may be taken to resolve disputes. This is exemplified by multi-party relationships where parties conduct activities in a range of jurisdictions where each party may be reluctant to agree to their contract being governed by the law of the other. The use of the distributed ledger technology may alleviate this friction by triggering a digitisation era. It ushers in standardisation of processes, mechanisms and contracts. This potentially minimises divergence in legal treatment of documents across jurisdictions and help foster inter-jurisdictional legal harmonisation, for example, in developing smart contracts in international trade finance.

Question 48

Please share your views below:

Question 49

Please share your views below:

Question 50

Please share your views below:

Question 51

Please share your views below:

Question 52
The functionality and use of distributed ledger certainly invites an examination of legal jurisdiction and governing law. There are two aspects: the legal jurisdictional challenges that arise from the use of cross-border technology and the potential for the technology to enable standardisation towards inter-jurisdictional legal harmonisation.

Multi-signature transactions illustrate the complexity of application of national laws to cross-border activities. These are transactions that involve more than two parties’ digital signature approval before settlement can happen. For example, when spending funds come from a crypto asset wallet address, more than one signature by an applicable private key paired with that wallet address are required before any funds can be spent. This may mean that no one individual can transact from this wallet address unless all required digital signatures are obtained. A typical example can be that two out of three digital signatures are required to effect a transaction. One implication is that the holders of the various keys are legal or natural persons, all resident in differing jurisdictions and providing their signatures from differing jurisdictions. Consequently, governing law in the event of a dispute arising due to non-performance of a specific contractual obligation may be complex and very challenging and therefore commands a more thorough reflection on how legal rules can apply. Extraterritorial application of national law can also lead to a number of contradictory legal decisions based on various interpretations of the ‘geographies’ of the physical or logical structure of the technology (eg, in the case of the internet, the location of the servers; collection and storage of information or of the cables where the information transits).

Chapter 8: Final questions
Response ID

Submitted to Law Commission call for evidence on smart contracts
Submitted on

About you

What is your name?
Name: Catherine Phillips

What is the name of your organisation?
Enter the name of your organisation:

Are you responding to this consultation in a personal capacity or on behalf of your organisation?
Personal response

If other, please state:

What is your email address?
Email:

What is your telephone number?
Telephone number:

If you want the information that you provide in response to this consultation to be treated as confidential, please explain to us why you regard the information as confidential. As explained in our privacy notice, we will take full account of your explanation but cannot give an assurance that confidentiality can be maintained in all circumstances.

Please explain to us why you regard the information as confidential:

Chapter 2: What is a smart contract?

Question 1

Please share your views below:

Many types of contractual obligation can be automated using computer programs. At one end of the scale are standard software programs, which may, for example cover regulatory automations such as regular payments out of a bank account via direct debit. If however the definition of ‘computer programs’ relates to smart contracts, this would include the following:

1 Banking & Financial Services Contracts:
Smart contract technology suits processes that are capable of standardisation, process driven and depend upon data transparency and the accurate transfer of information. As such, there are elements of the financial services industries that offer potential for the application of this technology. Examples include:

• ISDA has consulted with Clifford Chance, Jones Day, Linklaters and McCann Fitzgerald to publish a number of papers exploring issues relating to the application of technology such as smart contracts and DLTs to derivatives trading.

• The LSTA has issued two videos on blockchain, the second of which is on smart contracts and done some work on automating and coding a syndicated loan agreement. They have published an article on ‘The Loan Market, Blockchain and Smart Contracts’ which can be accessed here and states (on page 9) that having a ‘single source of truth as to the ownership of a syndicated loan ultimately will eliminate redundant, time-consuming, and costly exercise of multiple parties manually processing and accounting for primary allocations, payments and assignments’ and goes on to detail some of the processes which the author believes could benefit from operating on a blockchain platform:
https://www.lsta.org/content/the-loan-market-blockchain-and-smart-contracts-article-email-to-blockchain-dtd-10-10-18/

2 Escrow:
It would seem that the concept of smart contracts has the potential to replace some of the activities of nominees or escrow managers, providing the terms of the arrangement can be objectively measured. Current participants include Trustswap (on Ethereum) and Propy for property transactions. It could be effective as a payment system for freelance work through sites such as Upwork or in a probate context.

3 Digital Identity Management:
Ethereum blockchain has the potential to help resolve issues with identity theft and data monopoly. I am told that there is potential for data could be stored in an uPort app which can only be accessed by the owner of the data. John DOMingue of the Open University has spoken about the potential for blockchain to be used to process personal data in a decentralised trusted manner.

4. Other
A piece titled 'What are blockchains?' on the Open University website (https://blockchain.open.ac.uk/) states that "the startup company Tallysticks aims to use blockchain based smart contracts to automate invoicing. In October, 2015 Visa and DocuSign showcased a proof of concept demonstrating how smart contracts could be used to greatly speed up the processes involved in car rental – rental cars can be driven out of the car park without any need to fill in or sign forms. The ability to run smart contracts led Forbes to recently run an article comparing the future impact of blockchains to that of the Web and Internet."

Question 2
Please share your views below:
Agreed.

Question 3
Please share your views below:
I understand that the decision will depend upon the type of activity and volume of activity as well as the information sensitivity. If the business would like to benefit from private blockchain (specifically the consortium blockchain) then they will use the permissioned DLT system. Permissionless DLT is considered by some to be the real protected block chain as it is almost impossible to perform a 51% attack on the permissionless network, which is the inherent driver of security in these networks.

Question 4
Not Answered

Please provide examples of how these forms of smart contract have been used in practice:

Natural language contracts with an element of automated performance or hybrid contracts have been seen in development, for example:

- ISDA (https://www.isda.org/2019/10/16/isda-smart-contracts/
- LSTA which in its 2019 press release https://www.lsta.org/news-resources/lsta-automates-its-credit-agreement/ states that "(ii) smart contracts can be used to automate certain aspects of loan administration, particularly responsibilities performed by the agent; (iii) blockchain technology and smart contracts can be used to hard code regulatory compliance, in the form of approved addresses that can help ensure compliance with KYC/AML requirements; (iv) blockchain technology and smart contracts can be used to hard code disqualified lender lists to help streamline the borrower consent process; and (v) blockchain technology can be used to digitally represent a lender’s interest in a syndicated loan, creating opportunities to shorten settlement times for syndicated loan trades (and as explained during the webinar, these “transfer tokens” will not raise any questions about a loan being interpreted as a security)."

Question 5
Please share your views below:

Question 6
Please share your views below:

Question 7
Please share your views below:
I am aware of the following:
- Flashloans: a smart contract is coded to take a loan with no collateral then execute operation of buying / selling and repayment in one transaction. https://blog.coinodecap.com/what-are-flash-loans-on-ethereum
- Staking: actively participating in transaction validation https://crypto-economy.com/what-is-staking/
- Yield Farming: participants' funds are locked in lending pools where other borrowers borrow funds in exchange for interests https://coinmarketcap.com/alexandria/article/what-is-yield-farming

Question 8
Please share your views below:
Benefits:

For contracts with straightforward terms and objective/quantifiable triggers for action, the smart contract offers the following potential benefits:

1. Certainty
Automaticity offers certainty if smart contracts can be formulated to execute post completion conditions subsequent and perfection requirements such as:

- release of funds;
- documents requiring registration e.g. release and registration at Companies House, charging and transfer at HMLR;
- issuing of notices to customers in factoring arrangements;
- payment of stamp duty/receipt of stamped STF (subject to clarity on rules around e-stamping).

2 Efficiencies in execution and remittance:
In smart contracts, the remittance can be automated and executed automatically upon fulfilment of the conditions agreed and recorded in the code, without the need for human intervention or management from intermediaries and third parties (which adds to running costs).

3 Data security and protection:
Unlike a traditional contract, a smart contract can offer a qualitatively new level of security and confidentiality via the cryptographic protection of blockchain technology. This is particularly the case if the contract is stored on a private rather than a public ledger.

4 The time needed to formulate the contract:
I am told that, if parties are adopting a ready-made contract platform (such as Ethereum or Hyperledger Fabric), the time needed for preparing, drafting and formulating a contract can be reduced to minutes.

5 Access to contractual benefits:
Using smart contracts to automatically process insurance claims or delay/repay schemes will result in an increased number of claimants benefiting from the terms of their insurance cover and lower processing costs per claim.

6 Physical presence:
The smart contract is inherently suited to remote and international working patterns and to the use of electronic signatures.

7 Archiving:
Archiving traditional contracts requires time, space, administration, and supervision. I am told that the archiving of smart contracts happens automatically and securely, thus saving time and resources.

Additional costs

1. Development and testing:
Contracts will need to be developed and tested. Costs will vary but for complex and/or large scale arrangements, this phase of the project will need to be carefully worked through. It would seem wise to consider interactivity with other systems/oracles at time of creation to maximise shared knowledge and create scalability.

For contracts incorporating an element of natural language, there may be coders and lawyers involved in the contracting process, which may increase costs.

2. Running costs:
Ongoing costs will include payment of notes and processing power, for example as referenced in the call for evidence at para 5.38 and in this article (dated 10 February 2021) which refers to Bitcoin using 'more electricity than Argentina' owing to the powerful computers required to verify calculations: https://www.bbc.co.uk/news/technology-56012952.

Query whether the systems benefit from traditional economies of scale or whether there is a tipping point at which scale increases running costs?

Chapter 3: Formation of smart contracts

Question 9

Please share your views below:

It is anticipated that:
• terms will be coded in the smart contract;
• contracts incorporating an element of natural language will have the capacity for an electronic signature to be applied;
• both parties will interact with the smart contract and cause a serious of triggered logics to execute a series of actions until the contract has executed the full logic which demonstrating that an agreement have been achieved.

The systems also lend themselves to unilateral contracts, which can be accepted by conduct. It would be interesting to hear the Commission's views on any novel steps that the contracting party should take in order to protect against the risk of the counterparty suffering from lack of capacity e.g. ultra vires acts of companies or individuals who are minors, drunk or lacking mental capacity.

Question 10

Please share your views below:

I am told that the following languages are available:
1 Solidity – specifically designed
2 JavaScript
3 Rust
4 Golang
The decision in R Software Solutions Partners Limited v HM Customs & Excise suggest that this is possible providing that the programs have been held out by parties as a mechanism for agreement.

This could apply:

1. Where the blockchain cryptography provides the user with public and private keys, which form the user's identity on the block chain. On the face of it, the contracting party's identity is not known. It is not easy to link the public key back to the user but, I gather, this is not impossible.

2. Where the scale of the contracting arrangement means that parties log real identities but neither party is known to each other. For example, the smart contract which handles flight delay compensation, is an open public smart contract that the flight company and the users can use to register the flight delays terms and conditions via a website and, one anticipates, will be frequently used.

Recently, I am aware of Ion Science Ltd v Persons Unknown and others (unreported), 21 December 2020 (Commercial Court), in which the Commercial Court granted a proprietary injunction, worldwide freezing order and ancillary disclosure order against persons unknown, along with a Bankers Trust order against the parent companies of two cryptocurrency exchanges, in a cryptocurrency initial coin offering fraud claim.

Express terms denying intention to create legal intentions may be acceptable (as per call for evidence document) but it seems appropriate for them to be subject to UCTA and contained in natural language elements of contract.

Many parties will not be aware of the distinction at law that the presumption to create legal relations only relates to express agreements and may not apply to acceptance by conduct, which could become more prevalent in the context of unilateral smart contracts.
Chapter 4: Interpretation of smart contracts

Smart contracts should be thoroughly tested before being deployed. However:
- it is possible that the outcome of a feature of the code may only become apparent after deployment. This could occur if a scenario arises that was not envisaged at the start of the transaction and has not been tested (e.g. LIBOR transition, Brexit or a move to negative interest rates);
- is it possible that variations in coding styles or interpretation of instructions could lead to different outcomes? We have learned that document automation processes benefit from both the lawyer and coder understanding what a document is trying to achieve as well as the mechanics of coding. Could the same be true of the smart contract coding process?

The current approach to contractual interpretation focuses on the primacy of the language. If this is extended to the interpretation of the coded terms of smart contracts then the focus should arguably be on what is written (assuming the terms of the code are clear). If a computer is reading the contract and applying the terms (and assuming there is no natural language explanation or precedence clause to fall back on) then the court needs to understand what the computer has been instructed to do. It would seem that these are the actual terms of the contract.

If the terms are interpreted by the standard of a person with reasonable knowledge of the code, then this could lead to the outcome where a computer is in breach of contract despite performing the terms as written. If the parties have made an error in the terms captured in the contract then arguably this should be dealt with by some other remedy.

It is anticipated that the smart contract will typically be accompanied by documentation that explains the functionalities coded and the behaviour of the smart contract.

The coded element of smart contracts is useful for standardised automatic transactions but not nuanced or subjective terms. Natural language will need to be incorporated in order to incorporate any term that does not have an automatic, objective measure and effect.

Traditionally, extraneous evidence is required only where the terms of the contract are not clear.

Parties may benefit from incorporating a natural language explanation of terms and a precedence clause to determine which of the sources should be given greater weight.
As mentioned above, it would appear to be good practice to include a natural language translation in the contract and a precedence clause to determine whether the code or natural language section has precedence if a dispute arises between them.

**Chapter 5: Remedies and smart contracts**

**Question 31**

Please share your views below:

The blockchain is immutable, which means the smart contract cannot be changed in the same way as a natural language contract. The only way to change the contract of which I am aware is to destroy the old contract using a self-destruct function (that would need to be embedded into the contract code) and deploy a new version of the contract for the parties’ use.

On a permissioned system it may be possible to make a balancing entry but that would not necessarily be sufficient if there is the contract is set up to execute repeat transactions.

**Question 32**

Please share your views below:

In this context, it would seem that there are increased opportunities for both parties to make mistakes about the contractual terms which would not be covered by the current doctrine of common mistake.

**Question 33**

Please share your views below:

I understand that:
1. The smart contract must be thoroughly tested so that both parties are satisfied with the results.
2. Help files can be presented on webpage (or some other natural language content) explaining the functionality of the smart contract.
3. The steps of the smart contract can be defined in a way that the user accepts the smart contract functionality before executing.

**Question 34**

Please share your views below:

**Question 35**

Please share your views below:

**Question 36**

Please share your views below:

**Question 37**

Please share your views below:

**Question 38**

Please share your views below:

**Question 39**

Please share your views below:

**Question 40**

Please share your views below:

There could be challenges with the ability to terminate a contract if the code does not make appropriate provision for this.

Frustration may be able to be written in if it can be objectively measured, however the circumstances of contractual breaches are often subjective and unsuitable for automatic execution.

**Question 41**

Please share your views below:

The Loan Market Association facility agreements contain fallback provisions in the event that a particular ‘oracle’ is not available on either a temporary or long term basis.
Question 42
Please share your views below:

Chapter 6: Consumers and smart contracts

Question 43
Please share your views below:

Question 44
Please share your views below:

Question 45
Please share your views below:

Question 46
Please share your views below:

An average person is likely to need coded terms to be accompanied by an explanation before entering into the coded contract. However, just as high net worth individuals are able to self-certify for FSMA purposes, perhaps the protection needs to be targeted in order to avoid a blanket legal requirement that would run the risk of undermining the flexibility for fluent coders to agree terms between themselves.

Is the Commission considering issues connected to loss of personal identifiers and personal keys?

Chapter 7: Jurisdiction and smart contracts

Question 47
Please share your views below:

Yes, owing to:
- the pseudonymous nature of some contracts;
- the multi-jurisdictional locations of parties, actors (computers) and effects of the contract;
- the potential for coded contracts to be silent on choice of law.

Question 48
Please share your views below:

Question 49
Please share your views below:

I do not think that this is possible. Art 3(1) states that a contractual obligation shall be governed by the law chosen by the parties. A protocol does not have the status of law.

However a protocol could set out the basis on which contracts must be interpreted and, in doing so, potentially operate in a similar way to the governing rules for letter of credit transactions captured in the UCP 600. The UCP 600 rules must be explicitly incorporated to be applicable to those contracts but have the benefit of being internationally recognised.

Question 50
Please share your views below:

I understand that this is possible but do not have an example of the coding to share.

Question 51
Please share your views below:

Question 52
Please share your views below:

Question 53
The location of the nodes do not correlate with the location of the parties or place of performance and therefore it does not seem to be appropriate to locate jurisdiction of the contract on this basis. The COMI of a party or location of activity would appear to be more relevant.

Question 54

Please share your views below:

- Any specified governing law
- Location or COMI of parties
- Place of performance
- Location of contractual subject matter

Question 55

Please share your views below:

I agree with the analysis. Location of nodes is problematic as they operate across borders and do not signify a real connection with any jurisdiction. The place of formation is also challenging for a virtual contract.

Chapter 8: Final questions

Question 56

Please share your views below:

1. It would be useful to understand how data protection issues will be managed. The ability to recall, amend and delete data on the immutable record has the potential to conflict with laws on data protection if is has not been anonymised.

2. Whether protection is available for consumers in the event of loss of a personal key.

Question 57

Please share your views below:

Below is a link to an article by the blockchain council, listing the top 10 countries leading Blockchain technology:

Question 58

Please share your views below:
Introduction

This Response is submitted jointly on behalf of the Chancery Bar Association (ChBA) and the Commercial Bar Association (ComBar) and in response to the Law Commission’s Call for Evidence on Smart Contracts, published 17 December 2020.

We have assumed for the purpose of these responses that references to ‘code’ in the Call for Evidence are to deterministic code only, and our comments do not address the use of non-deterministic code. We do not respond to every question posed by the Call for Evidence but have selected those on which our members have experience and expertise.
Question 9: In what ways can parties reach an agreement through their interactions on a distributed ledger?

This will depend on the type of transaction that is being undertaken.

1. Cryptocurrency transfer

Here the agreement is made off-chain and the blockchain provides a mechanism for the discharge of the obligation to transfer the cryptoasset. So, if Alice agrees to sell 1 ETH to Bob for £1,300, Bob must provide his consideration in money and Alice will instruct her wallet or custodian to send 1 ETH to Bob.

2. Coin offerings

Here, again, the agreement is made off-chain, although in a more automated fashion. If there is an initial coin offering, generally the person seeking to acquire the new tokens will connect a crypto wallet to the system, describe how much is being spent and then the tokens may or may not be available for delivery. This is an offer by the purchaser to buy the tokens, which might be accepted by the issuer. Provided the purchaser satisfies certain criteria, for instance as to residence or nationality and as to identity, the offer can then be made and will generally be successful, without the intervention of any human.

3. Simple conditional flow

The earliest smart contracts imposed conditions on transfers of cryptoassets. For instance, a smart contract for the sale of a train ticket will transfer a coded right to travel on a train if 0.1 ETH is transferred to the address of a contract account. If Alice transfers 0.1 ETH to that address, the contract will run in the EVM and the ticket will be sent to Alice’s wallet to be shown to the appropriate machine at the gate to the train’s platform. Here there is an offer, by the train company, to use its smart contract to purchase a ticket and transferring the cryptoasset is the acceptance.

Such an acceptance can be likened to acceptance by post. Alice can do no more than send value to the smart contract and, in the case of a large enough blockchain like Ethereum can reasonably trust the system to operate as expected.

4. Decentralised Autonomous Organisations

These systems might be permissioned or permissionless and the nature of the agreement will depend on how it is structured. There is more than one aspect to the agreement. The first
important system was known as The DAO, which was a crowdfunding set of smart contracts but the model has been followed, with variations, and is popular as a governing body for automatic business systems running on other smart contracts on the blockchain.

With The DAO, ETH was to be sent to the address of a smart contract account on the Ethereum blockchain and DAO tokens were to be issued in return. There were no limitations placed on the number of tokens to be created and offered by the smart contracts and anyone was eligible to purchase them, so long as they transferred ETH to the smart contract. All of the ETH raised in the offering was pooled in an Ethereum blockchain address for use in funding projects that were approved by the members.

a. The advertising materials of The DAO (in a "white paper") described the structure of the system and provided the source code that would run on the EVM of the Ethereum blockchain. In a document entitled "Explanation of terms and disclaimer" it was stated that:

"The terms of The DAO Creation are set forth in the smart contract code existing on the Ethereum blockchain at 0xbb9bc244d798123fde783fcc1c72d3bb8c189413. Nothing in this explanation of terms or in any other document or communication may modify or add any additional obligations or guarantees beyond those set forth in The DAO’s code.

"When you click the “I Accept” button or check box presented with the terms you are agreeing that you are taking part in The DAO’s Creation under the terms set forth in The DAO’s smart contract code at your own risk.

"By Creating DAO tokens through interaction with The DAO’s smart contract code, you expressly agree to all of the terms and conditions set forth in that code."

b. The code was not written in formal legal terms and it is suggested that the agreement was contained in the way in which the system operated, as discovered from an evaluation of the code; the parties agreed to that structure and operation.

c. Even if the code of the smart contracts was capable of constituting the terms and conditions of the operation of the system, it is suggested that those operated on-chain and would not have affected the formation of the agreement between vendor and purchaser before a contract was made and that an offer by the promoter, Slock.it, was accepted by a purchaser transferring ETH to the relevant smart contract address. Even
though a purchaser could be identified only by their Ethereum blockchain address pseudonym, it is suggested that this would not have affected the validity of the contract; any difficulty would arise only if legal action was to be taken against the purchaser, but that was unlikely to be an issue because he would have had to pay the price before receiving the tokens.

d. It is suggested that a further aspect of the agreement between the parties, as determined from the operation of the system, was that the DAO holders were carrying on a business in common with a view to profit, within sections 1 and 2 of the Partnership Act 1890 with all the implied terms of that Act, insofar as they were not excluded by the words of, or the implications to be drawn from, the code (see section 19 of the Act).

Some modern DAOs are incorporated (for instance, The LAO).

5. DeFi protocols

A DeFi protocol generally operates by offering to apply certain defined and predetermined processes to cryptoassets that are transferred by a user to the protocol system. This might be a return of income or capital or an exchange for some other cryptoasset. The aim of the promoters of these protocols is to use automated processes, including the payment of a reward for depositing value or taking a fee for extracting value.

a. It is arguable that there is no counterparty to the deposit or extraction, which occur automatically with predictable results.

b. Another argument is that there are two parties to a transaction: the user and the controller of the protocol. Even protocols that are running without any intermediary in the process are subject to the adjustment of their operations. This adjustment is carried out on the instructions of a DAO controlled by its members according to the value of their holding of the DAO tokens. Their involvement in the transaction will depend on the structure of the DAO, whether it be a partnership or a company.

Although the point cannot be free from doubt, we believe that option b. is the correct answer. It may be appropriate to suggest legislation describing as the parties to the transaction those that have a connection to it, even if they appear to be detached from it by technological arrangements.

6. Uniswap and other Automated Market Makers
In cryptoasset exchanges that were common until recently, the exchanges of cryptoassets operate as market makers in an order book system, buying and selling on their own accounts and thus providing liquidity for trades. Automated Market Makers operate a system under which holders of cryptoassets deposit two or more types of cryptoassets to provide liquidity pools in those assets, collecting a fee for doing so, and persons wanting to exchange tokens send their tokens to a smart contract, which interact with the liquidity pool and calculate the rate at which the exchange will be made. The smart contracts cannot be altered and so, either there is no counterparty to someone exchanging a cryptoasset, or it is the collection of persons who have contributed to that pool.

One question is what is the correct legal analysis when someone deposits tokens into a liquidity pool. It is suggested that those tokens are merged into a fund that is held proportionately for the liquidity providers and the trustees of that fund are the liquidity providers themselves. The alternative argument is that they are converted into some kind of debt, like a bank account, but the identity of the debtor is problematical.

7. Non-Fungible Token purchases

Whereas cryptoassets are generally fungible, in that one token is interchangeable for another of the same type, developers are now creating tokens that are non-fungible and represent something else that is tied to the token on the blockchain. The most common examples of these non-fungible tokens (NFTs) are in the form of digital art, where the ownership of the original (digital) artwork (or control, or possession) can be proved by reference to the blockchain. The aspiration is for NFTs to represent real-world items, such as motor cars and houses, with the trick being to tie the tangible asset to the token so that ownership can be proved without reference to sale and purchase documentation.

NFTs can be sold by individuals by transferring the tokens using the blockchain, in the usual way, and in such cases the agreement will be off-chain, between buyer and seller. Generally, however, NFT artwork is sold through web businesses acting as art galleries, displaying renderings of the artworks and inviting offers. Here, the agreement is between agency and buyer and the agent will have a separate agreement with the seller.
Question 11: Do you consider that offer and acceptance can occur through the operation of autonomous computer programs deployed by the parties on a distributed ledger? If so: (1) in what circumstances? (2) on what legal basis?

Yes. There is no reason in principle why offer and acceptance cannot occur through the operation of autonomous computer programs deployed by parties on a distributed ledger, just as offer and acceptance can (and frequently does) occur when trading software places trades in an automated manner by interacting with the computer systems of counterparties or exchanges. The circumstances in which offer and acceptance could occur through operation of smart contracts deployed on a distributed ledger are many and varied. In principle, wherever a smart contract is deployed on a blockchain and one or more counterparties is invited to engage with the smart contract (either expressly or by implication of the fact of the deployment), that is capable of amounting to an offer and acceptance. Whether a binding contract forms as a result of such offer and acceptance will likely turn on whether the context suggests an intention to create legal relations. In a commercial context and where consideration passes (say, a cryptographic token is “paid”), a contract would usually be expected to result, on the conventional legal basis. There is no difficulty in the fact of offer and acceptance being conducted through the medium of software where both the smart contract and the code that interacts with it are deployed by or on behalf of legal persons.

Question 14: Are you aware of, or do you foresee, any difficulties in applying the law on consideration to smart contracts? If possible, please provide examples.

No. For example, in the third form of contract referred to in paragraph 2.32(3) of the Call for Evidence, where a smart contract results in fully executed promises from both sides occurring simultaneously, or immediately after one another, then both sides have got what they bargained for and it can clearly be stated that there has been good consideration passing from both promisors.

Question 15: Are you aware of, or do you foresee, any difficulties in determining whether the parties to a smart contract have reached a certain and complete agreement? If possible, please provide examples.

The functionality of code (assuming here we are only dealing with deterministic code) should make satisfying the requirement of certainty easier. The only difficulty is likely to be potentially
working out what is the precise transaction which the code has implemented, as might arise, for example, in certain instances of highly complex algorithmic trading. However, any difficulty identifying the transaction is likely to be a flaw in the part of the code which reports the transactions. In any case, this is a question of interpretation rather than of certainty.

**Question 16: Are you aware of any instances where the parties to a smart contract have expressly agreed that they do not intend to create legal relations?**

In relation to a cognate area, yes: parties agreed terms in a natural language contract governing access to a platform which had the effect of excluding an intention to create legal relations in relation to individual transactions executed by code on that platform (those transactions were ultimately, but not automatically, recorded on a distributed ledger).

**Question 17: Do you foresee any difficulties in ascertaining whether parties intend to create legal relations when they transact with one another on a distributed ledger?**

By definition, the first two forms of contract (paragraphs 2.32(1) and (2)) presuppose an intention to create legal relations in relation to the natural language elements of the contract, and so the only question becomes whether the codified parts of the transaction are intended to be part of that legally enforceable transaction (which is primarily an issue of construction). An example of this is where there are natural language terms and conditions governing a person’s use of a platform which intermediates with the distributed ledger and gives users the ability to activate certain “smart contracts”. The question in relation to the first two forms of smart contract is whether the terms of those “smart contracts” are part of the natural language contract, or independent legally enforceable contracts, or not intended to create legal relations at all. The second two issues arise also when dealing with the third form of smart contract in paragraph 2.32(3).

There is no impediment in theory or practice to finding an intention to create legal relations in relation to transactions executed automatically on a distributed ledger to form a smart legal contract in that third form. In non-code-based transacting, Courts have readily assumed that parties to transactions arising in social or family relations do not intend to create legal relations, and have conversely assumed that parties in business matters intend their transactions to have created legal relations.
It has been said that “The fact that the transaction was performed on both sides will often make it unrealistic to argue that there was no intention to enter into legal relations”: Steyn LJ in G Percy Trentham Ltd v Archital Luxfer Ltd [1993] Lloyd’s LR 25, 27. However that can only be a statement of practice, since it cannot overturn the presumption against an intention to create legal relations in a non-commercial context.

Distributed ledger technology typically replaces at least part of the commercial rationale of legally binding contracts in the first place, being securing performance and/or counter-performance. If performance is assured (subject to errors in the code or breakdown of the distributed ledger infrastructure), then transacting parties even in a non-social or family setting might well not ever need to consider whether legally enforceable rights would be useful to them, let alone intend (or be taken as intending) to create legal relations.

Much code with which we interact has nothing to do with contract, but simply provides functionality, such as (to take something of an extreme example) Word. While access to Word software is governed by contract (either the purchase of a licence or the subscription to Office 365), there is no sense in which the functionality provided by Word itself constitutes contracts between Microsoft and users. While the efficacy of that functionality may (at least in theory) attract legal consequences if there is any actionable misdescription about how it should operate, sounding in tort or for breach of a contractual representation in the contract governing access to that software, that does not entail contractual relations created by the functionality of that code itself.

Accordingly, when transacting by way of what appears to be a smart legal contract, it is important to distinguish between an intention (whether subjectively or objectively evidenced) to make use of the functionality of that code, and an intention to create legal relations in relation to individual operations of that code (what Question 17 refers to as “transactions”). Similarly, to the extent to which a software platform is used to provide access to such “smart contracts”, it is important to distinguish between any contract with the provider of that platform for access to, or use of, that platform and the individual operations of that code, and whether the latter are intended (subjectively or objectively) to constitute a legally enforceable contract.

Analysis may appear easier in cases where the potential transactions on a distributed ledger are advertised in terms redolent of contract, such as that the transaction is a “trade” or that access to a platform enables users to “take positions” in assets. However even then care is necessary: the “trades” or “positions” might, on analysis, simply be synthetic in the sense understood in the (fiat) derivatives markets, such that the transactions just reference values (or changes in values) of assets without resulting in any transfer of those assets. If so, then
the usefulness of such terms as evidencing, or supporting an assumption of, the parties’ intention to create legal relations in those individual transactions is significantly diminished. If then those synthetic transactions occur entirely automatically on the distributed ledger by virtue of operation of code, one is driven back to the general proposition in the immediately preceding paragraph above.

**Question 18: Do you consider that source code could meet the definition of “writing” in the Interpretation Act 1978?**

Yes. The definition of “writing” in that statute is extremely broad, and extends to any mode of representing or reproducing words in a visible form. There is no statutory requirement for “words” to be in any particular language – or indeed any natural language. It could not sensibly be suggested that a pricing mechanism in a conventional natural language contract is not “in writing” because it includes mathematical symbols; by analogy, there is no reason why source code should not be writing just because it does not consist (solely) of natural language words. Software amounts to a literary work for the purposes of the Copyright, Designs and Patents Act 1988; if it can be a literary work, it can be writing!

However, where it is necessary for a contract to be in “writing” (as that word is defined in the Interpretation Act 1978) the question of whether the source code of a smart contract is in writing may not be the relevant one. All depends on the context. Where the parties have agreed to be bound by a smart contract, their contract will in many cases not inhere in the source code but will instead be found either in some extrinsic agreement (pursuant to which they agreed to be bound by the behaviour of the running code) or in the executable code itself. It is more doubtful as to whether executable code is in “writing”; an extrinsic agreement may or may not be in writing, depending on how it was agreed.

In *Victor Chandler International Ltd v Customs and Excise Commissioners* [2000] 1 WLR 1296 (CA), the court applied an “always speaking” construction to an ongoing statutory provision in order to take account of developments that had taken place since the provision was enacted. The Interpretation Act 1978 is an ongoing enactment as its clear purpose can be fulfilled only if the meaning of the word “writing” is extended to include executable code. Accordingly, we do not consider that legislation is necessary.
Question 22: Do you consider that a deed recorded partly or wholly in code can satisfy the statutory formality requirements applicable to deeds and address the implications of the Mercury decision?

For an instrument to be a deed, it must make clear on its face that it is intended to be a deed and is validly executed as a deed (Law of Property (Miscellaneous Provisions) Act 1989, s.1(2). If it is being executed by an individual, it must be signed by him in the presence of a witness who attests the signature and it is delivered as a deed (s.1(3)).

In the Mercury case, the issue before the court was whether there were any reasonable grounds to suspect tax fraud in the carrying out of a tax avoidance scheme. Part of the fraud alleged by the Commissioner of Revenue and Customs were that documents had been signed by clients in draft and the signature pages had been transferred to the final versions, containing different details. On the question of the allegations relating to signature, Underhill J said that there was a common understanding among the parties that the document would exist as a discreet physical entity, whether in a single version or a series of counterparts, at the moment of signing.

We take as an example an electronic document in a file containing natural language content relating to the transaction in question (including intention). Passing this file to a smart contract that records the file on the blockchain will be initiated by the user clicking a representation of a button in his wallet software and it is suggested that such an action could be interpreted as the signing of the document (it is to be noted that, in the Ethereum blockchain system, a contract account does not have a private key, so no locking script is applied to value transferred to the account and there is no notional signing of the transaction). After the file has been sent to the smart contract, there is no on-chain signing; the smart contract takes the file and runs, using the file as its input data. It is suggested, however, that there are the following difficulties:

a. It is arguable that the file written to the blockchain is not the document signed by the person executing the deed. It is a copy. We do not think that this is a correct argument; the original that was sent to the smart contract was what was signed.

b. The question of proper attestation is, however, more substantial. Once the smart contract has run, a copy of the original file has been stored on the blockchain. If the witness sends another copy of the file to the smart contract, after pressing the usual button, that does not constitute an attestation of the original. Attestation requires the witness to be present at the signing and then to sign a statement on the deed to that
effect (see per Sir J Romilly, MR in Wickham v Marquis of Bath (1865-66) LR 1 Eq 17, at 24). It also falls foul of the Mercury decision.

c. Delivery might also be a problem. The file stored on the blockchain is not the original, so delivery of it (by some other code in the smart contract) cannot be considered to be delivery of the deed.

Accordingly, we consider that if it is thought to be desirable as a matter of policy to allow for deeds to be created in a smart contract (as to which we express no view), then we consider a tailored legislative solution is needed. That could simply provide that taking certain specified steps amounts to due execution. However, it will be important to carefully delineate the scope and applicability of such amendments so as not to include, for example, wills.

**Question 23:** Are you aware of, or do you foresee, any difficulties in applying the principles of interpretation to identify whether terms of a particular smart contract are contained in the natural language component or the coded component of the smart contract, or both?

There is no conceptual difficulty. Just like any other issue of incorporation or interpretation, the analysis required is one of seeking to ascertain the intention of the parties from the admissible materials. In practice, if a putative contract consists of a natural language document and code, the question of whether the code is (i) a source of contractual terms or (ii) a mere mechanism to implement terms agreed in the natural language, is very likely to be answered by a “traditional” exercise of construing the natural language element. That is because the natural language element would generally be expected to reveal (either expressly or by implication) what the parties intended in this regard, whereas, at least in the general case, it is very difficult to see how the code could do so given that code is inherently concerned with function rather than articulating a rationale for the function. However:

a. It is important to distinguish the object code that is processed by the platform and the source code written by the programmer: the latter may assist in the interpretive task, typically by means of code comments or through the naming conventions used, both of which are interpretable through the prism of natural language analysis.

b. In some cases, the function that a smart contract performs may itself assist in the interpretative task: if (for example) the code of a smart contracts performs a function that makes no sense unless that function embodies a contractual right, the fact that the parties have agreed to deploy that smart contract will often be a strong indicator that they intended the function to be a contractual term.
In short, whilst there is no conceptual difficulty, the task of applying the principles may in some cases be complicated and evidentially challenging – but no more so than many contracts consisting solely of natural language artefacts.

**Question 24: In what circumstances might disputes arise about the proper interpretation of the coded terms of a smart contract? Please provide examples where possible.**

The implicit premise of the question is a smart contract whose terms are embodied within the code rather than in an accompanying natural language contract. Given that premise, disputes about interpretation are likely to be very rare, at least in a commercial context. That is for two reasons. First, where parties agree that the code will define their terms, they will in very many cases be agreeing to be bound by the *behaviour* of the code (which is not susceptible to interpretation as such) rather than by a “meaning” that is capable of being separated from the behaviour. Secondly, even if approached as a straightforward matter of contractual interpretation, the modern approach to construing commercial contracts is to give language its natural and ordinary meaning, resorting to context, common sense and other interpretative tools only where there is ambiguity; save in very rare cases there will be no ambiguity in executable code, with the consequence that there will rarely be any basis to argue that the code does not “mean” what it “says” – in other words, the code simply does what it does.

In circumstances where there is a dispute about whether the code is doing what the parties intended, resolving such dispute should be the province of rectification rather than interpretation. Any attempt to “interpret” away “mistakes” in the code risks introducing considerable uncertainty, as even where it is obvious that a “mistake” has been made, it will often be far from obvious what “correction” is needed to reflect the contractual intent.

Theoretically, it is possible to develop code that is genuinely ambiguous. For example, in multi-threaded code, certain coding approaches may lead to non-deterministic behaviour whereby the output of a function depends on matters completely outside the code’s control. In those circumstances, a question may arise as to the *intended* behaviour. Such an ambiguity may need to be resolved by means of tools such as business common sense and factual matrix. However, that sort of issue does not arise in relation to the technologies typically used to code and deploy smart contracts.
Question 25: Do you consider that the meaning of a coded term of a smart contract would or should be determined by asking what the term would mean to a: (1) reasonable person; (2) reasonable person with knowledge of the relevant code; or (3) functioning computer?

As will be apparent from the answer to Question 24, our view is that the question of meaning as such will not typically arise in the context of the coded term of the smart contract: the code does what it does and that embodies and amounts to the contractual intent. That is equivalent to option (3): the meaning of a coded term would be determined by reference to the functioning program. That is an appropriate approach. If the terms of a contract are to be found within the code itself, it follows that the parties intended their contractual dealings to be governed by the operation of the code. In the (rare) cases where an ambiguity arises and it is necessary to “interpret” the code, the assessment should be by reference to a reasonable person with an understanding of the relevant code (because the context in which the ambiguity is to be resolved will necessarily include that code). That is different from “knowledge” of the relevant code (at least if that term is intended to suggest pre-existing knowledge of the code such as would be possessed by its developer): taking the developer’s perspective into account risks introducing an inadmissible subjective element into the analysis whereas any interpretation exercise should be an objective one.

Question 27: What practical or procedural steps could the courts take to resolve disputes about the interpretation of the coded terms of a smart contract?

We think the current civil procedure rules, in particular as to expert evidence and allocation to specialist lists, are capable of accommodating disputes about smart contracts. If smart contract disputes become frequent over time, the courts may well consider putting in place a process for identifying: (i) whether there is a dispute as to the identity of the terms (including whether the terms are in natural language sources or in code); (ii) the terms (or, if there is a dispute, the rival contentions); and (iii) the artefacts beyond code said by one or both parties to be relevant to the court’s interpretative task. It may also be necessary for the court to have expert evidence explaining what the code does and identifying and explaining any ambiguity. Beyond that, no special practical or procedural steps are likely to be necessary or desirable.
Question 29: In what (if any) circumstances should courts be able to consider evidence of the parties’ pre-contractual negotiations as an aid to interpretation of the coded terms of a smart contract?

In no circumstances. Permitting evidence of the parties’ pre-contractual negotiations as an aid to interpretation of the code terms of a smart contract would be undesirable because it would create an unprincipled distinction between the court’s approach to construing smart contracts and the court’s approach to construing natural language contracts. Moreover, there is every reason to suppose that permitting evidence of pre-contractual negotiations to be used would lead to precisely the same difficulties as those that led to the long-standing rule that such evidence may not be used in the interpretation of natural language contracts.

Question 30: Do you consider that the courts’ current approach to contractual interpretation might cause problems in the context of smart contracts? If so: (1) Can you provide examples or specific evidence of this occurring? (2) What could be done to solve these problems?

There is no reason in principle why the court’s current approach to interpretation of commercial contracts cannot be applied to smart contracts. Problems may arise if courts are tempted to “construe” unambiguous coded terms by giving them a meaning that differs from their coded behaviour: a problem of principle arises because holding that a coded function “means” something other than that which it is coded to do amounts to rectification through the back door; a problem of practicality arises because it will not always be obvious as to how the “meaning” as found by a court should be coded into a revised smart contract. The remedy is to ensure that where a contract is held to be embodied within code, the court does not seek to identify a “meaning” that is different or separate from the behaviour of the relevant code, save in cases of genuine ambiguity (which will in practice be extremely rare).

Question 31: Are you aware of, or do you foresee, any practical difficulties in ordering rectification of the coded terms of a smart contract? If so, do you think that parties to a smart contract will, in practice, seek rectification?

We do not foresee any practical difficulties from a legal perspective. However, Courts may need to be creative and flexible as to the form of order. Given the immutable nature of blockchains, amendment of the smart contract as such may be impossible, and a remedy will
need to entail deployment of a further smart contract whose practical effect is to adjust and thereby “correct” the behaviour of the earlier one. Details will no doubt vary from case to case.

In practice, parties to a smart contract whose terms are embodied in the code and who contend that the code is not behaving as intended will likely seek rectification (if they resort to the courts at all) for reasons identified above in the context of Question 24.

**Question 32: Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether the parties have made a common mistake when entering into a smart contract?**

We do not foresee any particular difficulties in applying the existing law on common mistake to smart contracts (on the assumption we are talking about deterministic code). Mistake, in a normal contract, requires a particular state of mind of a human; and common mistake requires that such mistake is shared by both contracting parties, and (among other things) be sufficiently fundamental that it makes the contractual venture impossible or at least makes performance essentially different to what the parties anticipated (eg Chitty para 6-015). A smart contract is an abstract thing, but will involve a human somewhere in the chain of development of the code underlying that smart contract. Therefore we see the issue as no more difficult than the question of attribution of a subjective state of mind to a corporate contracting party; in the present case the question is whether any mistake made by the human should be attributed to one or both parties. In practice, we would expect that the more remote in time to the actual transaction that the human involvement is then the less likely that any mistake will be able to be so attributed to any party, let alone to both parties, and the less likely that the mistake will be fundamental in the requisite sense. However they are matters of evidence, not matters which demand a revision of the rules of common mistake to take account of smart contracts.

**Question 34. Do you consider that the legal principles concerning unilateral mistake might need to be adapted to accommodate smart contracts concluded by computer programs without human intervention?**

Yes. In the Singapore International Court of Appeal in Quoine Pte Ltd v B2C2 Ltd [2020] SGCA(I) 02 (hereinafter ‘Quoine’) both majority (comprising three Singapore Court of Appeal justices, including the Chief Justice, and a former Chief Justice of the Australian High Court)
and the minority (Lord Mance) were effectively willing to “adapt” (in Lord Mance’s words at [193]) the legal principles concerning unilateral mistake to accommodate smart contracts concluded automatically without contemporaneous human involvement. The question is how the rules of unilateral mistake should be adapted.

We believe that the law of unilateral mistake can accommodate automatic contracting by deterministic code by adapting just the subjective element of knowledge needed by the non-mistaken party of the mistaken party’s mistake.

**Question 34(1)(a). is it appropriate to confine a unilateral mistake to a mistake about a term of the contract?**

We do not think it is appropriate to change the fundamental parameters of the rules of unilateral mistake simply because the means of contracting has involved some operations executed by code, or even if the entire process of contracting is executed by code. Those parameters, including the requirement that unilateral mistake be as to a term of the contract, are effectively limiting factors to ensure that not all unilateral mistakes lead to the unwinding of contracts. Any relaxation of such parameters here could not sensibly be confined to smart contracts in forms 1, 2 or 3 (Call for Evidence, para 2.32), but would then for consistency have to be applicable to non-smart contracts as well. We do not see any justification for that.

**Question 34(1)(b). what test should the court apply in determining whether a party has made a mistake?**

We address here a question not asked in the Call for Evidence but related to Question 34(1), being what test should the court apply in determining whether a party has made a (unilateral) mistake?

If there has been no contemporaneous human involvement at the time of contracting, it is still we consider possible to identify mistakes as to the terms of the transaction. For example, mistakes may be made in initial coding or in amending the code itself (such as forgetting to input a password when updating software, like in Quoine) or mistakes may be made in analysing what it is thought that the code achieves. Where those mistakes are as to such parts of code which affect the terms on which a smart contract is entered, then that may constitute a legally operative mistake by one party. We do not believe that the principles need any particular adaption simply because the transaction may be concluded by a smart legal
contract. (Mistakes in analysing what the code achieves might also cause actional misdescriptions of the functionality of the code.)

Question 34(2). what test should the court apply in determining whether the non-mistaken party had knowledge of the mistaken party’s mistake?

In our view mistake is relevant in contract law because it undermines the agreement on the basis that one party knows or ought to know that that agreement differs in some fundamental respect from what the other party thinks it is or means (see per Lord Mance in *Quoine* [181]). Therefore in our view, in order for mistake to be effective, its constituent elements (however they may be adapted to take account of smart contracting) ought to be established at or before the point of contracting. Whatever a party may have realised immediately after the transaction came to the party’s (actual, subjective) knowledge should, we consider, be irrelevant for the following reasons.

Allowing post-transaction evidence to be relevant to the question of the non-mistaken party’s knowledge (as Lord Mance did in *Quoine*) would require drawing a distinction between those who, like B2C2, emailed Quoine on the morning the disputed trades were discovered saying “Major Quoine database breakdown”, on the one hand, and those who woke up and celebrated the conclusion of an unexpectedly favourable trade. How one articulates such an occurrence after the event seems to say at least as much about how concerned one is for the integrity of the system as distinct from one’s own personal gain, and an approach which takes account of such post-contractual reactions rewards the more self-centred. In addition, the ability of parties to affect, retroactively, the validity of trades may lead those who have access to good legal advice to record responses to transactions in a manner calculated to achieve the desired result (upholding a profitable unexpected trade; undermining a losing unexpected trade), rewarding those with access to such advice over those who do not have access to it. It also unjustifiably, in our view, expands the very limited circumstances in which post-contractual events can lead to the unwinding of a contract. Finally, while high volume algorithmic trading by financial institutions may automatically flag and report unexpected transactions virtually instantaneously after they occur, it is hard to see what limit there would be to the length of time after a transaction has been concluded that evidence of subjective appreciation of it could be relevant. While Lord Mance envisaged that equity’s influence would enable third party rights acquired in the interim to be protected, concern for third parties’ intervening rights is significantly diminished if transactions can only be disturbed as a result of what the parties knew, actually or constructively, prior to contracting.
In our view the same considerations affect whether equity should intervene, and we therefore respectfully disagree with the approach of Lord Mance at [173] that equity’s conscience is capable of being affected by behaviour in seeking to retain the benefit of the mistake once it is discovered.

Although Lord Mance took account of post-contractual evidence, the approach articulated by Lord Mance more traditionally looked at B2C2’s state of mind at the time of the transaction, or rather “what B2C2’s actual state of mind would have been, given knowledge of the circumstances of the transaction as and when they occurred” [178]. This approach seems effectively to require supposing that the transaction was not concluded automatically by code, but transacted in person. We do not favour this approach since it effectively seeks to ignore the very fact which is unusual here – that the code is effecting the transaction automatically without contemporaneous human involvement. As the majority in Quoine put it, “it would be wholly artificial” to analyse the situation as if the parties had transacted on the floor of an exchange [97].

The majority’s approach in Quoine focussed on the knowledge of the last human involved on the non-mistaken party’s side prior to the transaction, and in that way is consistent with mistake vitiating consent of the parties. However the formulation of the majority is both seemingly very strict in one respect, but very flexible in another. It is strict in requiring that the non-mistaken party must have realised that the transaction being offered by the non-mistaken party’s algorithm would “only ever” be accepted by a party operating under a mistake, and yet the non-mistaken party does not (it seems) need to realised the precise mistake eventually made by the mistaken party at or prior to contracting. The “would only ever” requirement would appear very hard to satisfy in practice.

One alternative, which seeks to avoid these two extremes, is that the requisite knowledge of the non-mistaken party can be fulfilled if the last human involved on the non-mistaken party’s side foresaw that a mistake of the type which was eventually made was likely; then so long as the mistake actually made by the counterparty was a mistake of that foreseen type, one can say that the non-mistaken party had sufficient “knowledge” of the mistake for the rules of unilateral mistake.

A more radical approach, and one which Lord Mance’s judgment seems to encourage, is for the law to formulate an entirely new remedy (outside the strictures of mistake and frustration) for systemic computer breakdown, where code executes the transactions without contemporaneous human involvement. The obvious difficulty is in defining what sort of “breakdown” would be relevant, and what causal link there would have to be between that
breakdown and the precise transaction. There would also be difficulty in drawing the right lines between smart contracts of form 1 (and possibly form 2) set out in the Call for Evidence para 2.32, where there is some natural language contract, and so the traditional rules of natural language contracts might be said to be sufficient, and form 3 where the entirety of the transaction is embodied in code. So long as we are concerned only with deterministic code, then we do not consider that a broader, new remedy is necessary but that the incrementalist approach of the common law should here be embraced, even if minor tweaks are necessary to it by way of a “miscellaneous provisions” Act of Parliament. For example, the alternative outlined in the immediately preceding paragraph could potentially be introduced through legislation.

**Question 35:** Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether a smart contract has been entered into as a result of a misrepresentation?

We agree with the Law Commission and anticipate that in determining whether a party has been induced to enter into the smart contract by a misrepresentation ought not to give rise to novel legal issues. Any misrepresentation is likely to be as to the behaviour of the code, in which case it can be dealt with under orthodox principles.

**Question 36:** Are you aware of, or do you foresee any difficulties in applying the legal principles concerning rescission to smart contracts which have been vitiated for misrepresentation, duress or undue influence?

Blockchain contracts are, by their nature, automatic, self-executing and irreversible: once a contract goes onto the blockchain, it cannot be revoked or amended. This poses a similar problem to that discussed above in relation to rectification in that, assuming the requirements for rescission are met, in strict terms it is impossible to speak of ‘unwinding’ a voidable blockchain contract and restoring the parties to the status quo ante.

However, it is possible to achieve the same practical effect by creating a second, equal and opposite contract on a blockchain (which is equally irreversible), as was done by the trading platform in Quoine and ultimately sanctioned by the court. That was not rescission of the trade contracts in a strict legal sense, since the original contract remains on the blockchain and the reversing contract added on top. However, in practical terms the result is the same, and this
may well be sufficient in the majority of cases. Whilst it will be a bar to rescission where *restitutio in integrum* is impossible, the modern approach of the courts is to be flexible as to crafting a remedy that achieves the same practical effect. As such, we believe the courts will be able to respond flexibly on a case by case basis.

**Question 37: Are you aware of, or do you foresee, any difficulties in awarding damages for breach of contract where the terms of a natural language contract are performed automatically by computer code?**

We are not aware of and, in principle, do not foresee any such difficulties. We can see that there might be particular circumstances in which automatic performance could present difficulties in establishing the facts necessary to make a proper assessment of damages although such difficulties could just as easily occur in the context of natural performance (with the court being familiar with the concept of doing its best).

The example given in paragraphs 5.86 and 5.87 of the Call for Evidence does not seem to us to suggest difficulties in awarding damages (as opposed to determining the circumstances in which an essentially blameless party should be held to have been in breach). This does, though, foreshadow the matter raised in paragraph 5.88, i.e., whether the fact of automatic performance should have any (and, if so, what) effect on the ability of a party to rely upon an exemption provision. Whilst it might be hoped that "(bugs) in the program" of the type described in paragraph 5.86 would be relatively rare, they could hardly be described as unforeseeable and are likely, when they arise, to create a clear potential for litigation.

We would suggest that some consideration might reasonably be given as to whether the list of terms in Part 1 of Schedule 2 to the Consumer Rights Act 2015 should include a term excluding or limiting liability on the party of a trader where "a bug in the program" has resulted in non-performance or defective performance through no fault of the consumer (especially where it is the trader which has stipulated for automatic performance). There might also be a case for a similar amendment to Schedule 2 to the Unfair Contract Terms Act 1977 (although
the case for such an amendment is less obvious since that schedule contains a list of guidelines rather than examples of relatively common terms).

As to paragraph 5.89, we see no obvious feature of automatic performance which might present difficulties in deciding whether a particular term amounts to a penalty.

**Question 40: Are you aware of, or do you foresee, any difficulties in applying the law on frustration to smart contracts?**

We are not aware of and, in principle, do not foresee any such difficulties. We do, however, consider that it may be difficult to define the precise circumstances in which the test in *Davis Contractors Ltd v Fareham UDC* would be likely to be satisfied.

We agree with the view expressed in paragraphs 5.109 and 5.110 of the Call for Evidence, i.e., that the most obvious circumstance in which these questions might arise is where events beyond the parties' control affect the performance of the code.

We would, though, draw a distinction between, on the one hand, circumstances in which, to use the words of paragraph 5.110, “further performance of the code becomes impossible” and, on the other, those in which a contract has been performed but with an outcome radically different from what the parties might have anticipated. In *Quoine*, for example, the “Disputed Trades” were concluded at rates approximately 250 times the going rate. Whilst this performance (of contracts between the claimant and counterparties who were not parties to the claim) might be regarded as “radically different”, the vitiating factor relied upon was mistake rather than frustration, presumably because it was past performance which had been “radically different” (if it was) rather than prospective future performance.

Whilst we regard cases of the “future performance”-type as far from impossible and, indeed, far from implausible, we suspect that cases of the “past performance”-type may be, and may remain, more common, i.e., cases where, possibly because of the speed of transaction, it only becomes apparent after the transaction that something has gone radically wrong. The
tendency appears to be for such cases to be analysed by reference to the doctrine of mistake (suggesting that the law of frustration may be of limited application).

We see, therefore, no obvious case for legislative intervention.

**Question 42. Are you aware of, or do you foresee, any difficulties in applying the illegality doctrine to claims made in relation to smart contracts?**

We are not aware of, but do foresee, such difficulties.

We take as a starting point the observation of Lord Toulson JSC in *Patel v Mirza* [2016] UKSC 42, at [3]:

“A contract may be prohibited by a statute; or it may be entered into for an illegal or immoral purpose, which may be that of one or both parties; or performance according to its terms may involve the commission of an offence; or it may be intended by one or both parties to be performed in a way which will involve the commission of an offence; or an unlawful act may be committed in the course of its performance. The application of the doctrine of illegality to each of these different situations has caused a good deal of uncertainty, complexity and sometimes inconsistency.”

We see no reason why there should be any conceptual difficulty in applying the illegality doctrine to a claim based, for example, upon a natural language contract the terms of which are performed automatically by computer code but the performance of which involves the commission of an offence. Often, however, for example in the case of money laundering, the problem may lie in the circumstances of the formation of a contract which is ostensibly lawful.

The difficulties seem to us to be to a significant degree evidential and to result largely from the lack of transparency identified in para 5.116 of the Call for Evidence. The fact that a smart contract is tainted by illegality may be less obvious than a similar taint in the case of a natural language/traditional contract. The risk of detection of the illegality may still, though, as is observed in paragraph 5.116, be sufficient to deter a party from seeking to enforce such a contract in an English court (and it might be questioned whether English courts would wish to be regarded as a forum of choice for the enforcement of shady contracts).

Where, however, a party (perhaps an essentially innocent party) is seeking a restitutionary remedy, that lack of transparency may be unhelpful to the court in applying the test in *Patel v Mirza*. We consider that the court should be entitled to expect a claimant using an English
court to make good, as best it can, any deficiency in transparency resulting from the use of a smart contract. As to whether this is best done through substantive law or rules of court, we express no opinion. The right to expect transparency from litigants seems to us to be a principle of general application rather than one specific to smart contracts.

We note the observation in paragraph 5.115 about the use of smart contracts in by-passing “intermediaries … who would traditionally play a role in detecting illegal activity”. Nevertheless, there will still plainly be many instances of firms in the regulated sector entering into smart contracts. Whilst we consider that the court is entitled to expect transparency from all litigants, it seems to us that it is particularly entitled to expect such transparency from those in the regulated sector (perhaps as a regulatory obligation).

**Question 47. Are you aware of, or do you foresee, any difficulties in identifying the place of formation of a smart contract?**

The task of determining the place of formation will be fact sensitive. Focusing on the real-world actors and events involved in smart contract formation will reduce perceived conceptual difficulties associated with identifying the place of formation and will ensure that existing case-law in this area can be more readily applied to smart contracts.

The Law Commission has identified at para 7.20 that for smart contracts which involve a natural language contract with automated performance by code, the place of formation will be determined by reference to the parties’ natural language negotiations and the ordinary rules of contract formation. We agree with this analysis.

As regards solely code smart contracts the least disruptive and most coherent approach would be to focus on the place where the real-world actor is when the acceptance is communicated to them. This would uphold the general rule that an acceptance has no legal effect until it is communicated to the offeror (Chitty on Contract, para 2-044).

In our view, the Law Commission’s two scenarios featuring Alice and Bob should be answered as follows:

- Para 7.22 should be (2) – the place where Alice has the acceptance communicated to her.

- Para 7.23 should be (2) – the place where Alice, who has deployed the computer program that makes the offer, is situated when that acceptance takes place.
Question 48. In what circumstances do you think that jurisdiction to hear a dispute in relation to a smart contract could be based on the actions and location of an agent?

We agree with the Law Commission’s indication that it is unlikely to regard computers as being capable of being contracting parties’ agents.

The Law Commission is interested in understanding whether there are any third parties commonly involved in the formation of smart contracts who could be considered as agents for this purpose. This is a question which is likely to be best answered by individuals using smart contracts already.

Question 49. Do you think that a rejection of state law in favour of the rules contained in the platform’s protocol is or should be a choice that can be given effect to under article 3(1) of the Rome I Regulation?

No, for the reason given by Professor Dickinson. A platform’s protocol is not law for the purposes of the Rome I Regulation. Article 3(1) only validates a choice of a national legal system and not a choice of non-State rules.

As an EU-law derived instrument, taking a purposive approach to the Rome I Regulation would, in our, view result in an interpretation of ‘law’ within Article 3(1) as being a reference to a state’s law not the protocol of a DLT ledger.

Although recital 13 states that the Regulation does not preclude parties from incorporating by reference into their contract a non-State body of law or an international convention, this is a reference to incorporation, not choice of law (Dicey and Morris, para 32-050).

If it were favourable to permit parties to choose the rules contained in a platform’s protocol, greater certainty would be achieved if the wording of the Rome I Regulation was amended using appropriate legislative channels.
Question 51. What factors are capable of connecting a smart contract to a particular jurisdiction, for the purposes of article 4(3) and 4(4) of the Rome I Regulation?

We agree with the analysis of the Law Commission at para 7.48 that the presumptions contained in Article 4(1) of the Rome I Regulation pose no particular difficulties in the context of smart contracts.

Where none of the presumptions in Article 4(1) apply, we consider that traditional territorial connecting factors (e.g. habitual residence of a contracting party) can still be used in many circumstances by focusing on the real world actors involved.

The Law Commission gives an example at para 7.52 of Alice deploying a computer program on Ethereum, the code of which provides that if 10 Ether are sent to the program, the program will transfer a token to the account from which the Ether were sent. Alice, as the writer of the computer program and thus the characteristic performer, will have a habitual residence, which should be regarded as a significant connecting factor in that example. This again focuses on the real-world effects of smart contracts and means existing concepts can still be applied to them. This also ties in with the Law Commission’s indication that it is minded not to regard computers as being capable of being contracting parties’ agents. Real world actors, responsible for designing and writing computer code, should ultimately be responsible for its performance.

In Ion Science Ltd v Persons Unknown (unreported, 21 December 2020), Butcher J found that there was a serious issue to be tried for claims in deceit, unlawful means conspiracy and by way of equitable proprietary claim where claimants were fraudulently induced to transfer bitcoin for a fraudulent ICO. There was a good arguable case that English law applied because the damage under those claims occurred in England as the place where the relevant cryptoasset, bitcoin, was located prior to being transferred by the Claimants. In the absence of any authority as to the lex situs of a cryptoasset, the court referred to the analysis by Professor Dickinson (at 5.108 of his book, Cryptocurrencies in Public and Private Law) and suggested that the lex situs is the place where the person or company who owns the cryptocurrency is domiciled. In fact, paragraphs 5.106 onwards of the book are concerned with the choice of law applicable to transactions with cryptocurrencies and suggested that they were governed by the laws of the place of residence or business of the participant with which the participation is most closely connected. Nevertheless, the court was satisfied that there was at least a serious issue to be tried that the lex situs is the place of domicile of the owner is the correct analysis.
For tax purposes, HMRC take the view that the location of an exchange token is the residence of the beneficial owner (see para CRYPTO22600 of the HMRC Cryptoassets Manual).

There is a range of views from the authors of this response as to the significance of the location of the private key, if different from the location of the beneficial owner of the key. One view is that because the private key is necessary to dispose of or transfer a cryptoasset, the location of the private key is likely to be the most significant connecting factor. Another view is that the habitual residence of the beneficial owner remains the more relevant connecting factor, as the location of the key may be arbitrary. For example, there may be multiple copies of a private key stored in different locations which begs the question of which of those locations should be ‘the’ location of the private key. It is also possible that there is no, or no easily identifiable, physical location for a private key. For example, keys stored on hot wallets online will not have a readily identifiable physical location. Finally, habitual residence may be thought to be more in line with the general structure and factors listed in Articles 4(1) and (2) for which there is already a significant body of case-law.

Nevertheless, we consider that the courts are able to grapple with these areas of difficulty by applying existing principle, and do not indicate the need for legislative reform. Identifying appropriate connecting factors will obviously be a fact-sensitive exercise in an individual case. However, our view is that traditional connecting factors will continue to be useful and which already operate successfully in a digitised transactions, for example:

- The habitual residences of the contracting parties;
- The place where performance of the contract is to take place (see further below);
- The location of any property represented in the contract.

**Question 52. Are you aware of, or do you foresee, any difficulties in the context of smart contracts in applying the choice of law rules that apply under the Rome I Regulation to contracts of carriage (article 5), consumer contracts (article 6), insurance contracts (article 7) and individual employment contracts (article 8)?**

We agree with the Law Commission that there are no particular difficulties that we are aware of or foresee in relation to the law applicable to smart contracts in these four situations.
Question 53. *Do you think that a rule of jurisdiction based on the place of contractual performance can be applied where the performance takes place on a distributed ledger?*

As a distributed ledger has no ‘location’, it would be difficult to ascribe performance on the ledger to a particular jurisdiction.

In our view however, performance of the contract in this context ought to be tied to the real-world actors responsible for bringing about performance.

To use the example given by the Law Commission at para 7.52, Alice’s (the real-world actor responsible for deploying the computer program) domicile should be regarded as the place of performance of the contract as she is the individual responsible for bringing about performance.

As regards the example given by the Law Commission at para 7.69, we agree that this example does not present difficult issues where an obligation has to be physically performed in the real world.

As regards the subparagraphs at para 7.70 we consider that performance should focus on the individual responsible for doing the thing required under the contract. Under para 7.70 A we consider that the domicile of person crediting a cryptocurrency to a private key would be the place of performance of the contract. Real world actors are still required to ‘do’ things to bring about performance of the contract.

Question 54. *What factors do you think are capable of connecting a claim in relation to a smart contract to a particular jurisdiction?*

We consider that the same policy considerations which are relevant to determining jurisdiction in other areas of law are equally applicable in the context of smart contracts. Focusing on the fact that individuals will be suing other individuals in smart contract litigation, jurisdiction should also be focused on those individuals, just as it is under existing jurisdiction legislative frameworks.

Bearing in mind the appropriate caveats made by the Law Commission regarding the impact of Brexit, it seems to us that similar connecting factors to those traditionally applied to determine jurisdiction, can be applied to smart contracts:
a. Individual defendants will still have a domicile;

b. The provision of goods and services pursuant to a smart contract, will still have a place of performance;

c. See our approach to locating place performance which is solely on the DLT above by focusing on the habitual residence of the individual responsible for bringing about performance;

d. Consumers will still have a domicile;

e. Immovable property will still have a location;

f. Property will still have a location. Cryptoassets and property which exists solely on the DLT will obviously require further consideration by legislators and courts, but there is some indication that the habitual residence of the owner (likely the private key holder) of such property will presumptively be the situs of such property (see Butcher J’s judgment in (1) Ion Science Limited (2) Duncan James v Persons Unknown at para 13, albeit accepting the relevant caveats which apply as regards the authority of ex parte urgent injunctions).

**Question 55. Which, if any, rules for establishing jurisdiction do you consider will be most problematic in the smart contracts context? Do you agree with our analysis of the issues as described in this call for evidence?**

Aside from identifying the situs of wholly internal DLT assets, we consider that existing rules of jurisdiction can be pragmatically applied, as they are, to smart contracts. In our view this can be done by focusing on the individuals involved in contracts.

There will no doubt be evidential difficulties associated with identifying defendants and their domicile. However, this is a practical rather than a conceptual difficult which can be overcome by relevant experts in tracing.

We do not consider that the location of the nodes participating in the distributed ledger to be a good ‘connecting factor’ for the following reasons:

a. It is unlikely that one node as opposed to another can be identified as being responsible for a transaction;
b. Nodes are likely to be spread in various locations across the globe, with no apparent connection to the transaction in issue or the individuals involved. Focusing on the location of a node is therefore more likely to produce arbitrary results compared with the location of the individuals involved in the transaction or the property in issue pursuant to the transaction.

Aside from this point we are largely in agreement with the Law Commission’s analysis of the conflict of laws issues arising from smart contracts.

Question 56. Are there any issues we should be considering on smart contracts beyond those we discuss and ask about in this call for evidence?

We consider that there are five main issues that should be considered in relation to smart contracts beyond those that are discussed and asked about in the Call for Evidence, namely: sustainability and the environment; consumer protection; trust; costs; and development of the common law.

1. Sustainability and the environment.

We consider that it may be thought desirable to give further thought to whether a wider use of smart contracts using blockchain technology may counteract efforts to mitigate climate change in line with current UK policies in this area.

The UK has taken a leading role in calling for action to tackle climate change. It has ratified the Paris Climate Agreement which is a legally binding international treaty which entered into force on 4 November 2016, signalling the UK’s commitment to being part of a global effort to curb the effects of climate change. On 12 December 2020, the UK communicated its new Nationally Determined Contribution under the Paris Agreement to the United Nations Framework Convention on Climate Change. This commits the UK to reducing economy-wide greenhouse gas emissions by at least 68% by 2030 compared to 1990 levels.¹ This is amongst the highest in the world and commits the UK to cutting emissions at the fastest rate of any

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major economy so far. The UK was the first G7 nation to legislate for a net zero target by 2050.²

One implication for the environment of blockchain technology which forms the usual storage place of smart contracts relates to its enormous energy consumption and possible negative impact on the climate. It is rare to come across results regarding the energy consumption of blockchain technology since there are multiple variables which are unknown, making it difficult to determine the exact value for the energy consumption of a multitude of open distributed networks.³ However, it would appear to be generally agreed that blockchain technology which is reliant on Proof-of-Work consensus mechanisms and a computationally intensive “mining” process is likely to be more energy-intensive than a non-blockchain centralised alternative. Blockchain technology may even be “energy-intensive by design”⁴ in order to protect against attacks and safeguard security, with energy consumption involved not only in the mining process but also in validating new blocks and updating local databases.

An important consideration would therefore be whether smart contracts consume an amount of energy which may be regarded as disproportionate when compared to their utility, especially in a time when electricity remains largely generated from fossil fuels. This may give rise to the need for tariffs to be imposed on certain activities. This may be prohibitive for new joiners and in turn, lead to anti-trust and fraud issues.

The potential for smart contracts to give rise to a large amount of electronic waste is another important consideration. It is estimated that currently, an estimated 2 million tonnes of Waste, Electric and Electronic Equipment (WEEE) items are discarded by householders and companies in the UK every year.⁵ According to the Environmental Agency, WEEE is the fastest growing waste stream in the UK.⁶ This can add to environmental pollution and health risks if e-waste is not properly disposed of.

Smart contracts are executed by a network of miners who reach consensus on the outcome of the execution and update the contract’s state on the blockchain. Since miners compete with one another, this may lead to an endless search for increasingly efficient mining hardware with

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⁵ https://www.hse.gov.uk/waste/waste-electrical.htm
⁶ http://www.environmentlaw.org.uk/rte.asp?id=245
greater computational firepower and in turn, the quick obsolescence of these machines and a concomitant problem with managing increasing volumes of e-waste.

With WEEE representing one of the fastest growing types of waste in Europe and continuing to rise every year, there may be a need for greater regulation in this area. The Waste Electrical and Electronic Equipment Regulations 2013 (as amended) is the underpinning UK legislation in this area whilst issues surrounding the exportation of e-waste is governed by the Trans-frontier Shipment of Waste Regulations 2007. According to DEFRA, the UK has so far been doing pretty well on its official collection targets of e-waste.\(^7\) It will need to be considered how the increased use of smart contracts may affect current UK policies in this area, including enforcement activities.

Whether smart contracts pose a threat to the environment and sustainability efforts may depend, to a large extent, on technological developments, including innovations in contract execution and the use of alternative mechanisms for distributed consensus, e.g. Proof of Stake. Smart contracts may in fact present the potential to support environmental protection, including opportunities to make existing energy consumption and production processes more transparent which may enhance their sustainability.

2. Consumer protection

It may be desirable to give further thought to wider context of consumer protection, and the extent to which smart contracts will impact on existing legislation, in particular in the areas of consumer protection and overriding mandatory rules.

Although parties are generally free to enter into agreements, subject to certain limitations and exceptions, the English courts have at times felt the need to protect parties in certain situations by determining whether they had the capacity to enter into a legally binding agreement. For example, contracts may be voidable if made by a minor or persons who are mentally disordered or intoxicated at the time of contracting. Since smart contracts may have no or limited means to test for capacity, it is questionable whether legislative measures need to be taken to impose legal limitations on who may have access to, e.g. private encryption keys or circumstances when e.g. a smart contract can be signed, in order to safeguard the interests of those whom the State may regard as requiring additional protection.

In addition to safeguarding the interests of and protecting parties to the contract, certain legal rules which constitute “minimum standards of justice and morality” are considered so basic to

a legal system that they cannot be derogated from. Parties are not able to evade the application of overriding mandatory rules that would otherwise be applicable if the matter were to come before the national courts, simply by resorting to arbitration. In a similar vein, we consider that parties should not be able to escape these rules simply through the use of smart contracts. As a means of adjudication which seeks to evade human supervision, it is questionable to what extent smart contracts are able to cater for the notion of overriding mandatory rules.

Although smart contracts seek to eliminate or reduce the human element from the adjudication process, it is questionable whether by doing so, this simply mandates reintroducing legislative oversight at the front end of the process in the form of new or increased regulation of contracting software platforms or blockchain validation nodes to prevent smart contracts from facilitating illegal or disfavoured conduct and to prevent “code-savvy parties” taking advantage of the “code-naïve”.

The issue of language has already been explored in the Call for Evidence. It would be important to consider whether smart contracting fits in with existing efforts to do away with “legalese” and simplify contracting language.

3. Trust.

It may be desirable to give further thought to the different types of contracting and the role of trust in the process of smart contracting.

The use of smart contracts atomises the contractual process, stripping away the time dimension of interactions between parties. Contracts fall along a spectrum with a long continuum, ranging from spot contracts to various forms of relational contracting. It may be helpful to further analyse the culture of contracting and to explore the extent to which smart contracts are used in, and able to cater to, ongoing relationships as opposed to discrete exchanges only.

One major claim by the proponents of smart contracts has been that smart contracts and blockchain technology enable a ‘trustless’ environment. Although smart contracts may reduce or remove trust between contracting parties, it is questionable whether trust can be removed altogether from the process of smart contracting or whether smart contracts simply require a shift of trust from counterparties to other intermediaries and systems. The use of code requires the reduction of natural language that is infinite and can be read and understood by humans to machine-readable code which must be complete and predefined with very strict rules of syntax and semantics. This requires trust to be placed in coders, software platforms and
software developers. The regulation of those areas will be equally important to development in this area. Given that most (if not all) contracts will necessarily be incomplete, we may see the shifting of trust to oracles or arbitrators who are brought in to resolve disputes, simply shifting trust from one entity to another.


We consider that it is important to give further thought to the issue of costs, not only in terms of financial costs but also reputational costs. Although some aspects of contractual remedies are considered in the Call for Evidence, we consider that it would be helpful to give thought to the issue of efficient breach and the role (if any) this would play in the context of smart contracts.

Although smart contracts may be hailed as reducing contracting costs, it is questionable whether their use would simply see a shift from ex-post to ex-ante costs. Most (if not all) contracts are incomplete in that that they do not specify an outcome for every possible state of the world. On the other hand, smart contracts can accommodate only limited contractual flexibility and must be written in precise, fully defined computer code since they cannot be modified once executed. It should be considered to what extent the lower costs of monitoring and enforcing a smart contract may be offset by the higher upfront costs of negotiating, drafting and specifying the precise terms of an agreement, and whether the ex-ante information costs involved in determining all contingencies would make smart contracting overly costly and impractical for all but the most simplistic of contracts.

Another important consideration is the role of efficient breach in the context of smart contracting. Under current English law, specific performance is awarded infrequently and the courts have moved away from awarding an injunction where damages constitute sufficient compensation (see, e.g. Coventry v Lawrence [2014] UKSC 13). Under the current legal framework, there is also allowance for the possibility of efficient breach. The difficulty of allowing for efficient breach in smart contracting is that the self-executing and self-enforcing mechanisms of such automated processes would not appear to allow for breach at all. However, especially in the context of a contract running over a period of time and/or involving complex unforeseeable external circumstances, one or both parties may at a later point wish to extricate themselves from the contract. It may be important to consider the role of economic efficiency to contracting and the value of forcing contracting parties to remain in a relationship.
and to continue having to comply with contractual obligations even in circumstances where the cost of performance outweighs the value of performance.

5. Development of the common law.

There is a longstanding debate as to whether the development of the common law is stifled by the success of arbitration. It may be helpful to explore if and how the nature of smart contracting in being both private and confidential may impede the development of the common law by removing cases away from the scrutiny of the courts and allowing them to be decided behind “closed doors”.

**Question 57. Which other jurisdictions should we look to for their approach to smart contracts, and why?**

We consider that it may be helpful to consider the measures adopted by the following jurisdictions. We recognise that there may be other jurisdictions which have implemented measures in relation to smart contracts that we have not been able to include in our list below which should not be taken to be an exhaustive list.

2. US

There has been legal recognition of smart contracts in statute. In particular, Arizona has expressly set out in legislative form that smart contracts may exist in commerce, and that a contract relating to a transaction may not be denied legal effect, validity or enforceability solely because that contract contains a smart contract term. A definition for smart contracts is provided for in the legislation, being “an event-driven program, with state, that runs on a distributed, decentralized, shared and replicated ledger and that can take custody over and instruct transfer of assets on that ledger” (Arizona Revised Statutes Title 44. Trade and Commerce § 44-7061). We consider that it may be helpful to follow this approach and set out a definition or definitive guidelines in statute, for the purpose of identifying what constitutes a smart contract.

3. Singapore

We have referred to the decision of the Singapore International Court of Appeal in the case of Quoine. Singapore government agencies have also developed the OpenCerts platform, which uses Ethereum smart contracts to issue and validate digital certificates for graduates of local
educational institutions. Singapore appears to be rather advanced in the use of smart contracts and we consider it would be helpful to look to their approach in this area.

4. China

The Supreme People’s Court has recognised that blockchain evidence is acceptable. The Hangzhou Internet Court in China appears to have become the first court in the world to embrace smart contracts. A blockchain database is used by the court to assist with keeping track of evidence. There also appears to be some form of smart contracting features applied to the blockchain data.8

5. Sweden

The Swedish National Land Survey (Lantmäteriet) has been conducting trials of a system that uses blockchain technology and smart contracts for land registration. If successful, the project could have a major impact on how land deals are conducted by minimising the risk associated with manual handling and transferring of land documents or contracts.

6. Estonia

The Estonian e-health system is underpinned by blockchain technology. The Electronic Health Record is a nationwide system integrating data from Estonia’s different healthcare providers to create a common record every patient can access online. This functions like a centralised national database and is a powerful tool for doctors to access a patient’s records easily from a single electronic file. Each person that has visited a doctor in Estonia has an online e-health record containing health information that can be tracked.

7. Nigeria

A smart contract can satisfy the legal requirements of a legal contract under Nigerian law provided that it satisfies all elements of what constitutes a valid contract under Nigerian law.⁹

8. Australia

In February 2020, the National Blockchain Roadmap was released. Several Australian Government agencies have sought to clarify the regulatory issues that affect the implementation and use of blockchain. For example, the Australian Securities and Investments Commission has released guidance in relation to when the use of blockchain technology may attract regulation under Australian financial services regulatory laws. The Australian Taxation Office has released guidance in relation to the tax treatment of digital assets. Following legislative changes in 2018, digital currency exchange operators with a geographical link to Australia are now required to comply with Australian anti-money laundering and counter-terrorism financing laws. The Federal Government has provided funding to Standards Australia to develop international blockchain standards in concert with the International Organization for Standardization.¹⁰

⁹ Mondaq comparative guide, available at https://www.mondaq.com/Guides/Results/14/156/all/4/Nigeria-Blockchain-Smart-contracts

To: Green, Sarah

Subject: Call for evidence on Smart Contracts

Dear Sarah,

I have reviewed the call for evidence on behalf of the CLLS Financial Law Committee.

We do not feel that the questions raised on this consultation engage our particular expertise. The questions are largely about the methodology and technical nature of smart contracts, which other colleagues are more skilled in.

In the context of financial contracts using smart technology, the demands of regulation are such, that contracts will be likely to contain a traditional national language element and also to have all the characteristics of a normal contract (consideration, writing (whether natural language or code), full identification of the parties) and to be capable of execution electronically, a topic on which both the Law Commission and the CLLS Committees have done considerable work. It is important to distinguish between automatically executing contracts with smart elements, which may be used by traditional businesses in dealing with their customers, and trading systems that trade an artificial commodity, such as bitcoin.

Issues related to trading systems such as bitcoin and their particular characteristics mainly seem to us to arise from the fact that they operate outside of the sphere of financial regulation. Such is their potential that they may well be replicated in regulated contexts, where issues of anonymity and lack of location are likely to be overcome by the requirements of regulators and choice of law and jurisdiction will become the norm. So far as involvement of financial institutions currently trading in bitcoin type systems are concerned, regulators have moved to make it is clear that this is at the financial institution's own risk, if permitted at all. No value will be attributed to holdings in these systems for regulatory purpose. This constrains the scale of interaction. Government and regulators are considering the way forward in relation to these systems and any change to a more regulated environment would be likely to remove many of the legally difficult aspects of current unregulated systems.

There would be issues if a smart contract were required to be a deed, but this is really a narrow issue, perhaps best explored in the context of the revision of the law on deeds, because if the special status
of deeds were abolished, or the formalities in connection with traditional execution of deeds were relaxed, those changes would determine what, if anything, needed to change in the electronic world, and in what way.

I know that colleagues in other fields will respond and I hope you will not feel this short generic response is disrespectful.

With kind regards,
The Law Commission’s Call for Evidence on Smart Contracts
Clifford Chance LLP response

Clifford Chance LLP welcomes the opportunity to comment on the Law Commission’s Call for Evidence on Smart Contracts (the Consultation). Our response is set out across several linked documents as, on certain points (in relation to formation of contracts between software, or electronic agents, and to challenges to such contracts, as well as on remedies more generally), it seemed more appropriate to us to consider the questions and issues raised thematically, rather than on a question-by-question basis.

Our comments are based on the experience of lawyers across our broad fintech practice advising on blockchain, distributed ledger technology (DLT) and smart contract products, as well as platforms for electronic contracting more generally for a diverse range of clients, and across a large number of jurisdictions. However, the comments in this response do not necessarily represent the views of every Clifford Chance lawyer, nor do they purport to represent the views of our clients.

We would be happy to discuss our response further, as needed.

Question 9: In what ways can parties reach an agreement through their interactions on a distributed ledger?

Please refer to linked document "Legal considerations around smart contracts" where we consider this question thematically.

Question 11. Do you consider that offer and acceptance can occur through the operation of autonomous computer programs deployed by the parties on a distributed ledger?

Please refer to linked document "Legal considerations around smart contracts" where we consider this question thematically.

Question 17. Do you foresee any difficulties in ascertaining whether parties intend to create legal relations when they transact with one another on a distributed ledger?

Please refer to linked document "Legal considerations around smart contracts" where we consider this question thematically.

Question 18: Do you consider that source code could meet the definition of "writing" in the Interpretation Act 1978?

In most circumstances, yes. We agree with the Law Commission’s conclusion that a smart contract which takes the form of a natural language contract, performance of which is automated by code, would meet the requirement for a contract to be made “in writing”. We also agree that the terms of a smart contract which reside in source code are likely to technically satisfy an "in writing" requirement.

However, we think that the wider analysis around this question in the Consultation contains two assumptions that should be tested. The first is whether the determination that “visibility” means that something must be human readable remains correct as a policy matter, considering continuing advances in technology. The second is that a distinction is made between source and computer readable object (or binary) code (which results in the conclusion that terms which reside in object code alone are not "visible", and therefore that smart contract terms recorded solely in object code could not be "in writing"), which is overly simplistic and should be reconsidered.
It should be considered from a policy perspective what the appropriate outcome is for different types of contract and the law clarified accordingly, taking into account parallels that can be drawn with foreign languages, for example, for consistency.

"In writing" requirement

The general rule is that contracts need not be made in any particular form to be legally binding, i.e. they are binding whether they are made in writing, orally or by conduct. However, some contracts must comply with applicable statutory requirements. For example, contracts for the sale or disposition of interests in land, bills of exchange, promissory notes, bills of sale and regulated consumer credit agreements must be made “in writing”. This requirement has a direct impact on smart contracts, which are harnessed to facilitate the exchange of property, shares, etc. For the purpose of clarifying the meaning of the statutory requirement for “writing”, Sched 1 of the Interpretation Act 1978 defines writing as “typing, printing, lithography, photography and other modes of representing or reproducing words in a visible form, and expressions referring to writing are construed accordingly”.

The definition in the Interpretation Act 1978 is wide, and it has been shown that it can be applied flexibly in case law to accommodate new technologies. However, there is ambiguity as to whether some types of electronic records satisfy the requirements for being "writing", particularly in relation to the requirement that words must be “in a visible form”. The Law Commission has construed the "visible form" requirement relatively narrowly, confining it to such forms of communication capable of being displayed as legible words. For example, in its 2001 advice, the Law Commission concluded that the visibility requirement could not be satisfied by EDI messages exchanged between computers which were "not in a form (or intended to be in a form) which can be read (other than by another computer system operating according to the same EDI protocol)". The 2001 advice goes on to clarify that electronic messages do not need to be actually read by (or visible to) humans but simply be capable of being read. The base concern around EDI messages therefore seems to be that the messages are broadly written in binary code, which is not generally legible by human readers and is therefore deemed to be not "visible". This is also supported by the Consultation.

This raises two questions. The first is whether the determination that "visibility" means that something must be human readable remains correct as a policy matter, considering continuing advances in technology that may lend weight to an argument that such a distinction is no longer appropriate. The second is whether it is correct to have determined that object code is not human readable and therefore that it cannot be deemed to be "visible" for the purposes of the Interpretation Act.

Visibility

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1 Sections 2(1) and 2(3) Law of Property (Miscellaneous Provisions) Act 1989. Land transactions may also be required to abide by several other formalities, including deed requirements as per s52 Law of Property Act 1925. On the question of whether smart contracts could satisfy deed requirements, please see our response to Question 22.

2 Halsbury's Laws (no 64), para 224.

3 Sections 60 and 61 Consumer Credit Act 1974.

4 For example, in Golden Ocean Group Ltd v Salgaocar Mining Industries PVT Ltd [2012] EWCA Civ 265, the Court of Appeal held that words displayed in electronic form, either exchanged by way of email or as attached documents, meet the statutory "in writing" requirement because it enables words to be displayed on the computer screen of the sender and receiver, and therefore represents words in a visible form.
The first is a broad policy question which does not seem to have been considered by the Law Commission, and we would suggest that it does this as part of its ongoing review. While it may well be deemed desirable from a policy perspective that those contracting are aware of and have understood the terms on which they are doing so (and that a judge would be able to do the same), this goes beyond what the Interpretation Act currently provides and what is required as a matter of English law except in certain cases (e.g. in relation to assessing unfair terms in consumer contracts). If a person is deemed free to sign a contract in a language that they don’t understand (but could with the assistance of a human or machine-provided translation and assuming no vitiating factors), it could be argued that it is somewhat arbitrary to make a distinction between languages based on the fact that a human translator may be more difficult to find. However, from a practical perspective, this would clearly impact availability of expert witnesses where required for court proceedings.

There is then a clear policy concern to be addressed here. It should be determined what the appropriate outcome is considering, for example, the relative importance of accessibility and transparency of contract terms, for different categories of contracts and different types of contracting parties (e.g. consumers vs. commercial parties) and the law clarified accordingly. In an age of borderless business and to counter any notion of arbitrary distinctions, it may make sense to look at this in the round with a broader consideration of how foreign language contracts can be entered into and constitute writing for the purposes of English law, and the resulting impact on the requirement for additional evidence and judicial interpretation.

Ultimately, smart contracts are likely to be performing some of the same functions as their equivalent paper-based versions, in some cases arguably with advantages due to their potential processing speed and certainty of terms and execution. For example, smart contracts on DLT platforms will immutably record agreed terms and conditions, which will be visible and accessible to relevant parties in accordance with the terms of the platform. There is potentially scope for miscommunication and misinterpretation to be reduced because records are permanently stored. These functions align with a number of UNCITRAL’s identified functions of paper-based writing requirements, which include:

- to provide tangible evidence of the intention of parties to bind themselves;
- to help parties to be aware of the consequences of entering into a contract;
- to provide a document legible to all;
- to provide a permanent record of a transaction;
- to allow a document to be reproduced and copies to be held by all parties;
- to allow authentication by way of a signature;
- to provide a document in a form acceptable to public authorities and courts;
- to finalise and to record the intent of the author;
- to allow easy storage in tangible form; to facilitate control and subsequent auditing for accounting, tax or regulatory purposes; and
- to create legal rights where writing is a required element of legal validity.

It is crucial that existing legal requirements crafted in an age where computer-based contracting was not in mind remain fit for purpose, or are clarified where required. One suggestion that could be
considered from a policy perspective is whether the requirement for "writing" could, in some cases, be replaced by an alternative analysis, whereby a new set of clearly defined standards apply that are designed to fulfil equivalent legal requirements for certainty, reproducibility, traceability and authenticity, including for example:

- to provide a permanent record of the transaction;
- to allow the transaction to be reproduced and copies to be held by all parties; and
- to allow authentication by way of signature, among other methods.

The application of such alternative requirements could be limited to help mitigate policy concerns, for example, it could be limited to commercial contracts and for parties who expressly elect such rules to apply.

It's worth noting that some jurisdictions have already introduced legislative approaches to clarify "in writing" requirements in scenarios where contracts are concluded electronically. By way of example, the Netherlands has specified the following requirements for electronic contracts to satisfy "in writing" requirements: (i) the agreement can be consulted by the parties; (ii) the authenticity of the agreement is sufficiently guaranteed; (iii) the moment on which the agreement was formed can be determined with sufficient certainty; and (iv) the identity of the parties can be assessed with sufficient certainty. Likewise in the US, the Statute of Frauds requires that, to be in writing, contracts must (i) be signed; (ii) reasonably identify the subject matter of the contract; (iii) be sufficient to indicate that a contract has been made between the parties or offered by the signer to the other party; and (iv) state with reasonable certainty the essential terms of the unperformed promises in the contract.

Source code vs. object code

In response to the second question around whether it is correct to state that binary code can never be human readable, we believe that the distinction that has been made by the Law Commission between source and object code in both the Consultation and its 2001 advice is overly simplistic and should be reconsidered – it is not true to say that "binary data cannot be read by a human person". Although it is over 20 years old and not written in contemplation of smart contracts, the principles elucidated in this essay are very relevant and worth considering here: https://www.cs.cmu.edu/~dst/DeCSS/object-code.txt.

Application to smart contracts

As set out in the Consultation, smart contracts can take various forms, from a written natural language contract accompanied by some degree of automated performance, to a fully coded contract with performance fully automated, and hybrids in between.

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5 Dutch Civil Code, Article 6:227a: Agreements formed by electronic means.

6 US Restatement (Second) Contracts, §131.
Where legal terms are coded, rather than being included in a written natural language contract or contract supplement:

- they may be incorporated into source code using programming conventions (known as programming languages, coding languages, or generally source code for the purposes of this Consultation), which are made up of symbols and letters; or

- the source code may then be "compiled" into computer readable code to execute its functions. This typically takes the form of binary code, which, it is alleged not even an expert programmer can read and interpret.

For the above reasons, whether a smart contract can be said to be "in writing" will depend on how the smart contract is constituted. We address how the requirement for writing would affect each of these options in turn:

**Pre-agreed written terms accompanying automated performance**

Under the current interpretation of "writing", we agree that there would be no issue where a smart contract takes the form of a written natural language agreement (sometimes referred to as "wrapper" contracts), with some degree of automated performance making it "smart". Naturally, it would follow that, so long as the elements for the formation of a contract under English law are present on the facts, such contract would meet any statutory requirement for a contract to be made "in writing".

**Terms incorporated into source code**

If the terms of a smart contract are said to reside in the source code, then the smart contract would, in theory, satisfy the "in writing" requirement under its current interpretation. This is because source code can (i) be displayed on a screen and (ii) be read and interpreted by an expert coder. The fact that the source code cannot be read and interpreted by a non-expert coder should not detract from the fact that the terms are found in written form, except in relation to consumer contracts as outlined below. Following the doctrine of freedom of contract, contractual parties are free to choose what language they would like their contract to be in and, in principle, it is difficult to see why an exclusion should be made for programming languages where both parties have agreed to that, although this should be confirmed from a policy perspective. In this regard, source code may be considered equivalent to a foreign language, which a contract counterparty or judge may require translation assistance with. However, as noted in the Consultation, we acknowledge that even when coded terms are "translated" into natural English, there is likely to be further guidance needed to be given by an expert coder on how a computer would actually interpret particular coded instructions (please see our response to Question 23 for further detail on this point).

**Terms incorporated into object code**

If the terms of a smart contract are said to reside in object code, then it is more difficult to argue that the contract is "in writing" in accordance with current Law Commission guidance in relation to the interpretation of what constitutes "visible form" and its view of object code. The Law Commission's conclusion that EDIs do not fulfil the "in writing" requirement limits the legal position of smart contracts that are required to be "in writing" but are recorded in binary or object code and are therefore considered not human readable or visible. For the reasons above, we do not agree with the technical analysis here and suggest that this position is reconsidered from a technical/factual, and also from a policy perspective.
**Consumer contracts**

Existing regulation on consumer contracts requires that contractual terms must "be expressed in plain, intelligible language and (in the case of a written term) [be] legible" to be considered transparent, as part of the assessment of whether any particular term might be unfair. This clearly imports a higher standard than a mere "in writing" requirement and it seems unlikely that contracts expressed in either source or object code could reasonably be considered "plain", "intelligible" or "legible" to an ordinary consumer.

**International considerations**

As the technology in question is inherently international, it is also worth considering the approach taken in other jurisdictions, which in some cases have already started to introduce legislative changes to facilitate the use of smart contracts and deal expressly with how existing requirements for writing may be met.

For example, Italy formally introduced rules on DLT and smart contracts under a new law enacted in 2019. This new law introduced an official definition of smart contracts as "computer programs that operate on distributed registers-based technologies and whose execution automatically binds two or more parties according to the effects predefined by said parties", and recognised that smart contracts satisfy the requirement for written form (known as "forma scritta"), subject to prior digital identification of the relevant parties through a process meeting certain requirements to be specified by the Agency for a Digital Italy. Although these requirements have not yet been specified by the Agency, they relate to the process for identification of the parties, rather than any defining characteristics of the smart contract. Provided that the parties are properly identified through said process, any smart contract that meets the definition above should satisfy the Italian requirement for written form.

Several state legislatures in the US, including California⁸ and New York⁹, have also sought to clarify the legal status and validity of DLT and smart contracts.

**Question 19: Do you consider that parties can "sign" an agreement recorded solely in code?**

Yes, we broadly agree with the analysis set out in this section of the Consultation and, in our view, parties can sign an agreement recorded solely in code. In blockchain or DLT-based systems this is likely to be evidenced by the use of a private key, as set out in the Consultation. In non-blockchain based systems, it is difficult to see why methods of contract acceptance which might be used to signify agreement (e.g. inclusion of identifying code, or ticking acceptance box) should be treated any differently to written natural language contracts where a wide range of alternatives have been held to satisfy signature requirements, provided that there is sufficient evidence of identity and intention.

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⁷ Section 64(3) Consumer Rights Act 2015.


In broad terms, the purpose of signatures (in a paper-based environment or otherwise) is one of proof\(^\text{10}\), i.e. signatures are used to provide certainty as to the personal involvement of the signatory with the content of an agreement and signify knowledge, approval and acceptance of the obligations within it (i.e. they aim to bind the signatory to the relevant provisions).

Electronic signatures have also been recognised as valid in statute\(^\text{11}\), including under the European eIDAS Regulation\(^\text{12}\) where an electronic signature has the very broad definition of "data in electronic form which is attached to or logically associated with other data in electronic form and which is used by the signatory to sign".

Technological development, combined with necessity through the COVID-19 pandemic, have accelerated the use of non-wet-ink, non-paper-based, electronic signatures. English law has rightly adopted a flexible approach in recognising and expanding what can constitute an acceptable signature. For example, the electronic pasting of images of signatures, automatically generated email footers\(^\text{13}\) and clicking "sign here" tick boxes\(^\text{14}\) have all been held to satisfy signature requirements.

In line with the analysis set out in the Consultation and the description set out in the Law Commission’s report "Electronic Execution of Documents"\(^\text{15}\), we agree that private keys should therefore be able to satisfy the statutory requirement for signature by evidencing intention to authenticate the agreement and demonstrating assent. The private key would operate to fulfil the function of the signature requirement and this should be applicable regardless of whether a contract is written in natural language or code-based.

As English law is generally permissive as to what constitutes a signature and to date the courts have adopted a pragmatic approach, it is difficult to see that any alternative method prescribed under non-DLT based systems for signifying an agreement to a coded contract would not succeed if it could be held to be equivalent to the wide range of existing alternatives.

**Additional issues**

It is not just a question of legal validity. A practical issue of electronic signatures will be the ability to trace where the signature has come from (i.e. who in fact signed the agreement), whether they intended to be bound and the content of the agreement itself, especially if there is a dispute about who in fact signed the contract. Use of a private key on a DLT platform is helpful in this regard, being specific to the holder (assuming they have stored details safely) and capable of being used to prove ownership, validity and integrity of a transaction. This means, in practice, that the use of smart contracts requiring private key validation may help to reduce fraud.

\(^{10}\) In Caton v Caton (1867) LR 2 HL 127 the House of Lords provided that the purpose behind the signature requirement is to "govern or authenticate every material and operative part of the instrument".

\(^{11}\) Section 7(1) Electronic Communications Act 2000. Section 7(2) defines electronic signature as "so much of anything in electronic form as – (a) is incorporated into or otherwise logically associated with any electronic communication or electronic data; and (b) purports to be used by the individual creating it to sign", which is arguably satisfied by a private key without considerable stretch of its existing definition.

\(^{12}\) EU910/2014

\(^{13}\) Neocleous v Rees [2019] EWHC 2462 (Ch).


\(^{15}\) (2019) Law Com No 386, Appendix B
Any alternative technology being used on non-DLT based platforms would need to be shown to sufficiently address the questions of certainty, authenticity and traceability.

**Question 20: Do you think that smart contracts using DLT are currently able to utilise eIDAS compliant advanced electronic signatures and qualified electronic signatures? If not, how do you think they could be designed to accommodate these types of signatures?**

Yes, we broadly agree with the analysis set out in this section of the Consultation and that DLT smart contracts should be capable of meeting the technical criteria for advanced and, in some cases, qualified electronic signatures. Whether a particular smart contract/DLT platform does meet the requirements will be a question of fact to be considered on a case-by-case basis.

We agree that eIDAS is not a framework commonly used in the UK (for DLT systems or otherwise). Although we have no experience of using it or any feedback on its credibility, we are aware of one DLT-based system that includes eIDAS compliance functionality and anticipate that more platforms will become available in due course.

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The eIDAS Regulation recognises three different types of electronic signature with increasingly robust methods of identification and verification: simple (basic electronic signature), advanced and qualified electronic signatures.

**eIDAS advanced electronic signature requirements**

An "advanced electronic signature" must satisfy the following four limbs (article 26) relating to its performance:

(i) **be uniquely linked to the signatory**

In a literal sense, no form of electronic signature based on a public-private key system can satisfy this requirement because a digital signature is linked to the user's private key, not to the user creating the signature and, typically, private keys would be stored on a computer or device as it is difficult for any individual to commit a private key to memory. A literal reading of the eIDAS definition of electronic signature, which is defined to be used by the "signatory", who must be a "natural person", leads to the same conclusion.

However, this interpretation cannot be the correct one. The principle of asymmetric cryptography will enable, through the public key, identification of the private key holder. Since the public key matches in a unique manner with the private key, and the private key is a secret key, the key pair check can validate that the signature unambiguously matches with the signatory's private key. We believe that English courts would be flexible in assessing this requirement.

This is supported by legal commentators (for example, Professor C. Sorge\(^\text{16}\) and Mason\(^\text{17}\)) who suggest that the literal interpretation was obviously not intended by the legislators and therefore it would be prudent for the wording of legislation to be clarified.

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(ii) **be capable of identifying the signatory**

Linking the public and private key pair to the particular person’s identity is required to ensure that it is the required signatory who is using the key pair in question. This condition can be met by issuing a certificate indicating the identity of the person and their public key, and the key pair itself, following completion of verification. Verification could be implemented in various ways in practice; for example, electronic submission of identity documents, or verification by sending a code by SMS or e-mail.

(iii) **be created using electronic signature creation data that the signatory can, with a high level of confidence, use under their sole control**

This requirement is effectively to demonstrate that the signatory is the sole master of their private key and should be capable of being met for DLT platforms, subject to certain practical considerations.

While a digital signature authenticates that a certain private key was used to create the relevant digital signature, it does not authenticate the purported signer. This means that the recipient will not know whether it was the expected signatory who actually used the private key.

There is no definitive standard as to what a "high level of confidence of sole control" means. It may be difficult for a signatory to argue that an electronic signature is under their sole control when their private key is stored on a computer.

The French Agence national de la sécurité des systèmes d'information, or ANSSI, has published a helpful document setting out that the means implemented must ensure an adequate level of security and mitigate risk of fraud, e.g. via the use of a PIN code enabling the signatory to unblock use of their private key.

(iv) **be linked to the data signed therewith in such a way that any subsequent change in the data is detectable**

This requirement can be met by the DLT platform performing a "hash" of the message before signing it electronically, which ensures the integrity of the signed message.

**Using advanced electronic signatures in DLT smart contracts**

Based on the above analysis, DLT smart contracts should be capable of meeting the technical criteria for advanced electronic signatures. Whether a particular smart contract/DLT platform does meet the requirements will be a question of fact to be considered on a case-by-case basis, based on the merits and architecture of each platform and their corresponding protocols. For example, permissioned DLT platforms where users are identifiable and use certificates issued by the organisation they belong to are more likely to meet the criteria than public DLT platforms like Ethereum, which operates on the basis of pseudo-anonymity, so although each private key will be linked to a particular signatory, the signatories themselves will stay anonymous.

**eIDAS qualified electronic signature requirements**

A qualified electronic signature is an advanced electronic signature (fulfilling the criteria set out above), generated using a qualified electronic signature creating device (Article 29) based on a qualified

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certificate of electronic signature (Article 28) issued by a Qualified Trust Service Provider (QTSP), which is accredited by a national entity. The QTSP must verify the identity of the signatory and issue a certificate as proof that the qualified electronic signature complies with the necessary standards.

The benefit to using a qualified electronic signature is that eIDAS provides that it will have the same legal effect as a handwritten signature (Article 25(2)). This reverses the burden of proof in comparison to the general position under eIDAS that all electronic signatures must be accepted as evidence but it is up to the person claiming it to prove their reliability.

**Using qualified electronic signatures in DLT smart contracts**

For DLT smart contracts to utilise qualified electronic signatures they would need to satisfy the above requirements. The use of a third-party certifier remains mandatory.

We have not seen advanced and qualified electronic signatures being incorporated into DLT platforms. However, we are aware of research around the integration of qualified digital certificates with permissioned blockchain platforms by leveraging existing services provided by the Connecting Europe Facility (CEF), including eSignature and eID, which are stated to create signatures in line with eIDAS\(^\text{19}\). We are also aware that there is also at least one commercial blockchain-based service recognised as an eIDAS-compliant QTSP, currently offering qualified electronic timestamping. It is likely that more platforms that enable the use of other qualified trust services (including qualified electronic signatures) will emerge over time.

On this basis, technically it should be possible to comply with the requirements for a qualified electronic signature on a DLT platform. However, there are practical and legal considerations that would need to be addressed.

**Practical considerations**

To achieve the highest level of security, qualified signature creating devices (QSCDs) are required to employ specific software and hardware to deploy strong cryptography that can protect the security of their signatures, while satisfying a number of demanding requirements\(^\text{20}\), including ensuring that only the signatory has control of the private key and that the signature creation data is unique, confidential and protected from forgery.

Completion of requisite identity checks for the signatory may require face-to-face identity verification, either by video or in person. This may slow down the signing and verification procedure and may be deemed to be unnecessary where use of particular DLT platforms provides additional certainty and security around parties’ identities.

**Legal considerations**

From a legal perspective, the certificate confirming identity verification will include personal data, which may lead to General Data Protection Regulation concerns, depending on how the data is processed by, and recorded on, the DLT platform. Non DLT-platforms would typically address these concerns in part by automatic deletion of documents containing personal data within a certain timeframe, which is not directly compatible with the immutability of DLT. There may be solutions that

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\(^{20}\) Annex II eIDAS Regulation
involve anonymised or pseudonymised data being stored on-chain, while the identity data itself could be stored off-chain, but we are not aware of these issues being addressed in practice.

**Q22: Do you consider that a deed recorded partly or wholly in code can satisfy the statutory formality requirements applicable to deeds and address the implications of the Mercury decision?**

While we broadly agree with the analysis set out in the Consultation that it may be possible for an agreement executed partly or wholly in code to satisfy statutory formalities applicable to deeds and address so-called "Mercury requirements" in certain circumstances, in practice we think that there are technical difficulties that will be problematic in many cases and that need to be resolved to give market participants certainty in this area.

We agree that the main difficulties are likely to be around execution as a deed, where witnessing requirements are generally seen to be outdated, and the Mercury implications of a deed needing to be "a discrete physical entity" with signatures and attestations forming "part of the same physical document" (while allowing for counterparts). It is unclear how this may translate to a DLT context or for code that is split across multiple execution files.

Certain documents must be executed by way of deed either as a matter of statute or common law, including contracts in relation to the transfer or disposition of interests in land and mortgages, powers of attorney, as well as agreements made without consideration.

Statutory formality requirements include that a deed must be: in writing; clear on its face that it is intended to be a deed; and both delivered and executed as a deed. As per our response to question 18, we think that the writing requirement could be satisfied in certain circumstances. We also think that specific wording or technical solutions exist that would allow satisfaction of the face value and delivery requirements.

Execution requirements are likely to pose more of a challenge. As per our response to question 19, we are broadly comfortable that coded contracts could be digitally signed, e.g. by use of a private-public key pair. However, it may require some flexibility in adaptation of the principles allowing signing in counterpart to allow for different parties to "execute" a coded deed.

A practical concern relates to witnessing signatures, to the extent that this is required (e.g. where an individual is executing for himself or herself or on behalf of a company). As outlined in the Consultation, as it stands, the law currently requires that a witness must be physically present when the agreement is executed, even where both the person executing the deed and the witness are executing or attesting the document using an electronic signature. This is a requirement that seems outdated. Indeed, the requirement has proved challenging in practice over the last 12 months during the COVID-19 pandemic and associated lockdowns, where signatories have struggled to find a suitable adult witness at the appropriate time on transactions that we have worked on, leading to delays and the need to find feasible workarounds where possible.

**Mercury implications**

The requirement that a deed be a whole physical document is likely to mean that an agreement recorded partly in code and partly otherwise (e.g. written or oral) is not able to easily satisfy the Mercury requirements. We agree that this will be much less of an issue where the agreement is recorded fully in written natural language, with code merely being used to automate some aspects of performance.
Where a contract is recorded wholly in code, a particular practical question will arise as to what constitutes the "full" code. For various reasons, code for a program may be split across various linked execution files. This may cause difficulties for a strict interpretation of the requirement that a deed be one whole physical document, which suggests that code must be included in one single execution file. It is possible to argue that the "whole" contract should be represented by those linked scripts that give rise to the DLT record recording the agreement/transaction in full, particularly where the scripts are all stored in the same folder/directory. However, this would likely require more detailed analysis of the files, particularly where the folder/directory contains a multitude of scripts that have not been used in that particular transaction. A log file or analysis of the record in a DLT-based system should provide the evidence required here, but it still seems to be a step away from the current requirements. We would therefore recommend that the position is expressly clarified.

Reform initiatives

We are aware of various initiatives in relation to deeds being undertaken by the Law Commission or other government agencies that may have an impact on this question. We very much welcome, and are happy to support, such initiatives. We would urge the Law Commission to ensure that deed-related issues occurring in relation to, or which are exacerbated by the use of, new technology, including DLT and smart contracts, are duly considered in them.

For example, we are aware that consideration of the law relating to deeds and variation of contracts is one of the suggestions in the Law Commission’s 14th Programme of Law Reform consultation and support this proposal. We are also aware that the Ministry of Justice is in the process of establishing an Industry Working Group on Electronic Execution in response to the recommendations made by the Law Commission in its Electronic Execution of Documents report. We hope that considerations around witnessing requirements, including consideration of alternatives to the requirement for witnessing and/or use of technology that might assist, such as video witnessing, will be considered here.

Q23: Are you aware of, or do you foresee, any difficulties in applying the principles of interpretation to identify whether terms of a particular smart contract are contained in the natural language component or the coded component of the smart contract, or both?

The primary issue that will impact interpretation of a smart contract is its nature. Put simply, is the agreement between parties an agreement that the program or smart contract should do whatever the program or smart contract does, or is it an agreement that the program or smart contract should do a particular thing? In the first case, the program or smart contract is the agreement. In the second case, there must exist a clearly identifiable agreement which is separate from the program or smart contract, such that it is possible to assess whether what it has done corresponds with that agreement. If it is maintained that the program or smart contract is a record of the terms of the contract then the first scenario applies, since the parole rule would likely prohibit evidence being admitted of contrary intention so the program or smart contract would become the contract. In the second case, however, the program or smart contract is simply evidence of what the parties agreed in their actual contract.

Unless there is a clear intention that both parties intended the first scenario, the code itself may be evidence of the terms of the agreement between them, but it is not (and can never be) a "contract" in the Chartbrook sense; i.e. something whose existence necessarily excludes other evidence of intention.

Challenges to the traditional principles of interpretation are less likely to arise where the terms of the contract have been pre-agreed in full and recorded in a written natural language contract. Then it will

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"simply" be a case of determining whether the code indeed reflected that agreement and performed as expected, albeit this is still an exercise likely to require expert evidence from professional coders.

We agree that it is likely for the foreseeable future that smart contracts will almost always involve natural language negotiation and usually at least some written natural language terms.

**Interpreting coded terms**

With natural language contracts, courts are often asked to interpret contractual terms where the parties disagree as to their meaning because of the many ways in which human language can be understood and interpreted. However, computers do not interpret, they simply follow an instruction protocol.

This is not to say that a computer will always do what is right or expected. The computer will do what it is told, but the human(s) coding the contract (and thus agreeing and/or interpreting the terms to put them into code format) may have coded mistaken instructions, causing the computer to do something other than what the parties intended. As outlined in the Consultation, code cannot always be interpreted in a literal, natural language way.

As above, a different process will be required, depending on whether the smart contract is intended to form the contract itself or is merely an output or how the contract is intended to be performed.

As set out in the Consultation, the UK Supreme Court has emphasised that the natural and ordinary meaning of the language has primacy, with other information, such as external context or business common sense, assisting with the objective interpretation of the language used if the meaning of the language is unclear. However, applying this current approach to interpretation is likely to be challenging where terms are coded, as most people cannot interpret what a piece of code would mean to a computer.

Existing alternative approaches used by the court that might be helpful to consider here include:

- Admitting expert evidence when dealing with contracts whose terms include complex technical terminology or industry-specific concepts written in human language unfamiliar to the court.

- Interpreting terms according to a customary lexicon if parties have agreed to use industry terms based on convention. However, this is built on the idea that all parties to the contract would have understood the meaning to be the same for all engaged parties, given a specific line of business or trade. This may not be the case with parties to a smart contract that are not expert coders.

It is also worth acknowledging that a number of tools have been developed for auditing AI and demystifying how it works, including modelling and risk assessment tools that illustrate and assist with interpreting algorithmic behaviour. The UK Information Commissioner's Office has developed detailed guidance together with the Alan Turing Institute on explaining decisions made with or assisted by AI and steps and considerations to take in practice that may be instructive, as it illustrates that a piece of code can be explained using a number of different techniques. Equivalent explanations in the context of smart contracts may be useful for judges asked to opine on contractual issues. Auditing approaches, including those undertaken with the assistance of private sector developers, might help courts to explore

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22 Rainy Sky SA v Kookmin; Arnold v Britton; Wood v Capita Insurance.

23 Baldwin & Francis Ltd v Patents Appeal Tribunal [1959] AC 663.

the operation and effect of the code without relying on (or as additional supplement to) a direct translation of every word, symbol and instruction of the code.

We agree with the conclusions of then Professor at Bristol Law School (now Law Commissioner) Sarah Green in her paper ‘Smart Contracts: Interpretation and Rectification’ that a flexing or slight extension to the principles of interpretation set out in *Arnold v Britton* and *Wood v Capita Insurance Services Ltd* by Lords Neuberger and Hodge, respectively, could be applied to the interpretation of smart contracts, by using context and common sense to recognise that the language chosen by the parties is a technical one. We also agree that it is inevitable that coders called as witnesses would play a greater role in assisting interpretation than is typically seen due to the complexities of computer code and the way that it is executed by computers. Clearly as a matter of policy it will need to be determined whether this is an appropriate approach.

By way of example, two coders who are experts in two separate programming languages may interpret a particular instruction in a particular way, which may differ from one coder to another. A simple illustration of this is the following: in Python programming, when specifying a numerical range of 1-10, this instruction is in fact interpreted by the computer as a range of 1 to 9, whereas other programming languages may interpret it as a range of 1-10, or even 2-10. This seemingly minor architectural point could have dramatic legal ramifications as to deadlines and time frames. If we extrapolate this to more complex legal terms, we can see how the interpretative difficulties could escalate.

See also our response to question 25 below.

**Spectrum of automatability**

It is also worth bearing in mind the current capabilities of technology and what this means for coded obligations. Contractual provisions can be considered along a spectrum of how straightforward it is to automate them, from simple to complex:

<table>
<thead>
<tr>
<th>Simple</th>
<th>Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monetary transaction: ‘Transfer £1 from A to B at 12:00 GMT on 1 Jan 2018’</td>
<td>Use of complex legal concepts: ‘A will use its reasonable endeavours to do X.’</td>
</tr>
<tr>
<td>Asset ledger transaction: ‘Transfer ownership of asset X from A to B’</td>
<td></td>
</tr>
<tr>
<td>External input: ‘Add interest at LIBOR + 2%.’</td>
<td></td>
</tr>
<tr>
<td>Participant input: ‘Unless A and B otherwise agree, perform X on 1 Jan 2018.’</td>
<td></td>
</tr>
<tr>
<td>Dispute resolution: ‘If A and B do not agree, C shall decide.’</td>
<td></td>
</tr>
<tr>
<td>Meta-clauses: ‘If any term of this contract is held to be unenforceable, it will remain in effect to the extent that it is not invalid or unenforceable.’</td>
<td></td>
</tr>
</tbody>
</table>

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Terms will not always fit neatly into one category of this spectrum. In some cases, they might fall within two or even more of these categories. For example, an indemnity might require both external and participant input, as well as being based around a determination of reasonable belief.

Contracts are meant to be flexible enough to accommodate changing circumstances. One way to allow for flexibility is through use of discretion terms such as "reasonable" or "material". Deliberate discretion is something that can and should form part of contracts (including smart contracts) when parties deem it appropriate. The issue is when, in the pursuit of discretion, unintended ambiguity or vagueness are imported instead, which is a common cause of disputes over the nature or interpretation of drafted provisions in natural language contracts. There are currently various options that can be used in programming to achieve something akin to a discretionary outcome, for example:

- Inputting conditional statements that govern particular outcomes according to a set of events taking place. This is effective in hedging against specific risks, which may or may not occur, but are foreseeable given the nature of the transaction. Specific indemnification clauses could fall under this category.

- Using error checking and exception handling, i.e. error and exception catching functions. In computer programming, this is a more flexible approach to respond to exceptional or anomalous circumstances requiring a particular type of processing. Some programming languages will include "try… catch" functions to widen the scope of the exceptions that may be caught, including for instance catching external calls. Generally, exceptions break the normal flow of the code and instead execute a so-called "exception handler" to deal with the particular scenario.

However, the existing functionality of programming languages does not facilitate the same flexibility as natural language. For example, consider a commitment by a party to use its "reasonable endeavours" to achieve a certain outcome. That wording is specifically chosen, as a matter of drafting natural language contracts, as an alternative to a strict obligation, to indicate that there are circumstances in which that party will not be expected to perform because to do so would go beyond a certain threshold of "reasonableness", given the particular context of the obligation. It is open to the parties to specify exactly what will and will not be reasonable, but the choice of the term "reasonable endeavours" is a way of postponing that determination, so that the standard of what is or is not reasonable can be resolved based on a concrete set of facts when an issue arises. This type of concept is currently difficult to formalise as a well-defined set of instructions for code to execute. In addition, most AI technology available today is not able to make an adequate context-specific determination of reasonableness and, commercially there would likely be significant reluctance to rely on any such determination.

This will have an impact on the types of obligations that are being included in code, including whether certain types of contract will ever be suitable to be fully coded/automated. It means (in theory at least) that interpretation of coded terms should be a more straightforward exercise, given that only certain types of obligations which are clearer and more precise in meaning can be effectively coded.

There is considerable interest in developing single-use programming languages and templates for expressing contracts and laws, an example being Contract Description Language (CDL), currently under development at Stanford University, which would effectively enable the drafting and automation of more complex legal terms. It is also not difficult to imagine that AI will (sooner rather than later) be able to scan both computer code and the large body of natural language contracts already in existence, evaluate the existence of complex legal concepts, including duress, illegality and indemnification, and make a determination accordingly. Until these innovations materialise and, importantly, are accepted commercially, the English courts should be able to interpret smart contracts using code translation, interpretation and risk-assessment methods without departing entirely from existing rules of interpretation.
Question 25: Do you consider that the meaning of a coded term of a smart contract would or should be determined by asking what the term would mean to a:

(1) **reasonable person**;

(2) **reasonable person with knowledge of the relevant code**; or

(3) **functioning computer**?

We think the most effective outcome here would be (2), a reasonable person with knowledge of the relevant code, or, as clarified in the Consultation, a reasonable person with an understanding of both the meaning of the coded term and how the term will be processed and given effect to by a computer program (which may be quite different to a strict natural language interpretation of the given terms).

We recognise and agree that the courts of England and Wales typically take an objective approach to contractual interpretation, i.e. the court does not ask what the parties to the contract meant by the language they used, but rather what the words would have meant to a reasonable person equipped with the background knowledge available to the parties at the time of contracting. Whilst it makes sense to ask the reasonable person what he or she would make of a series of words, the reasonable person's interpretation of machine code does not equate to what the code actually means to, and how it would be given effect to by, a computer.

Simply engaging an expert to provide a literal translation for a judge to interpret is unlikely to be helpful as it is not only the literal meaning of what is written in the code, but also how the letters, symbols and numbers are together interpreted as logical instructions that the computer then follows as set out in our response to question 23.

The development of a "reasonable coder" test seems to be the most effective standard to evaluate the meaning of coded terms, and to further interpret whether a term performs according to the intended agreement. We agree that an analogy could be drawn with the *Bolam* test in the tort of negligence, which entails the court asking whether an established body of professional opinion would deem the defendant's action to have been reasonable on the facts. This distinction was drawn because trained technical experts (such as doctors or engineers) are in a far better position to identify the appropriate standard within their own profession.

A similar approach could be considered in relation to expert coders with some allowances built in, i.e. a court could seek interpretation by a reasonable body of experts, but retain full discretion as to its acceptance.

The analysis of any particular smart contract may require more than one reasonableness test to be applied. For example, the court might be able to rely on a standard reasonable person test to interpret what a reasonable person would have understood the parties’ intention to be in the particular set of circumstances, but then apply a reasonable coder test to determine what an expert would believe the

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28 *Bolam v Friern Barnet Hospital Management Committee* [1957] 1 WLR 582.


30 *Bolitho v City & Hackney Health Authority* [1998].
code to mean, and also to provide insight into whether the code actually performs as per intended agreement.

In some circumstances, it may be sufficient to apply the traditional "reasonable person" standard. For example, where all contract terms have been pre-agreed, either orally or in the form of a written natural language wrapper contract, or where the contracting parties and the programmer building the code have formulated a business process document, i.e. a design script of what the code should do, which is written in human language (which may or may not include a pseudocode element).

Determining what the meaning of a coded term is by considering the meaning by reference to a functional computer does not seem to be the right approach. Computers do not interpret the meaning of any coded terms; in fact, they do not read the coded terms as terms at all, they will simply execute the given instructions. As a result, "terms" as we know them are turned simply into a set of instructions that the computer will follow. This does not necessarily bear a direct relation to what the parties and/or the programmer intended.
Legal considerations around smart contracts:
Contracts between computer programs

There is a series of difficult legal issues which arise out of the use of computer software to enter into contracts and perform transactions. While electronic contracting has received greater focus recently, for example due to the development of blockchain and other distributed ledger technologies (DLT) and smart contracts on a commercial scale and artificial intelligence increasing in capability, electronic contracting is not a new concept. However, these advances in technology do mean that new considerations will arise more frequently.

In this note, we consider two questions which arise where two computer programs contract with each other, in circumstances where there is no separate written natural language contract and where there is no overarching framework governing such process (for example, as would typically be seen for electronic investment exchanges). While this is not a common scenario at present, it is likely to be seen more as use of electronic contracting becomes more common. These issues arise whether or not DLT is a feature of the underlying platform or software.

Capacity to contract

The first question is whether two pieces of software can in fact enter into a valid contract in the absence of human intervention. The key issue here is that English contract theory is based on the idea of agreement between parties. It is clear that a contract can come into existence where only one party is aware of the fact – this is the Shoe Lane principle\(^1\), and is widely relied upon today in situations where software makes prices and offers available on the internet such that these offers can be accepted by users and therefore create contracts. However, this principle does not apply where neither party is aware of the contract. Such contracts are common today on electronic securities and coin exchanges. In these cases, in general, the thing which converts the computerised interactions into contracts is a rule of the exchange which has the effect of binding both parties. Where such interactions occur outside an exchange, it is by no means clear whether a valid contract can come into existence at all.

The issue here is whether this should be clarified in English law.

Reversibility of performance

The second question concerns the consequences of a subsequent challenge to such a contract once made. Where a contract is made between two pieces of software, it is generally executed immediately and automatically – indeed, the ability to do this is one of the primary reasons for employing such software in the first place. However, such instant execution is only useful if it has some sort of settlement finality protection where the underlying transaction remains valid even if the contract pursuant to which it has been effected is challenged. These protections are generally available in established financial markets, but are less common outside them.

The issue here is whether it should be possible for parties to bring themselves within such a regime by agreement or otherwise.

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\(^1\) Thornton v Shoe Lane Parking Ltd [1971] 1 K.B. 532.
1. **Contract formation**

There are various ways in which electronic or smart contracts might be structured. This ranges from a written natural language contract, with some degree of automation as to its execution only, to a fully automated electronic or smart contract between autonomous computer programs, which captures all terms and conditions in code. Currently, most electronic contracts will either have written terms pre-agreed, either orally or in a “wrapper” written contract, or be entered into under an overarching framework which governs the process of contracting. For example, it is increasingly common for trading programs to enter into transactions directly with each other, but this generally happens within the parameters of investment exchanges or other trading venues, where the creation of enforceable contracts is a result of the application of the rules of the exchange or venue. However, in a limited number of cases, computers may deal directly with each other outside such venues, or these overarching rules may be held to not apply.

The problem that these situations give rise to at English law is that, technically, such interaction cannot create a contract. The basic position at English law (as well as many others) is entirely clear – a contract is created when an offer made by one of the parties is accepted by the other to whom the offer is addressed, and that acceptance is communicated to the offeror.\(^2\)

The conventional analysis of computerised action resulting in a contract is based on what might be termed the *Shoe Lane* analysis. This is based on the fact that an offer may validly be made, may be accepted, and may result in a contract, even though the person making the offer does not know that it has been accepted, or by whom.\(^3\) It is therefore perfectly possible to analyse the activities of a trading program as the making of a series of offers on behalf of the person who has set it in motion with the intention of being legally bound. Those offers may be accepted, and may result in valid and enforceable contracts, even though the owner of the program only finds out after the event that he or she has in fact contracted.

However, this analysis breaks down where the interaction is between two programs. If performance of a smart contract by a computer program is simply the coded execution of a series of instructions, then it is difficult to ascertain whether a computer program could distinguish between making an offer or accepting one. If all that the programs are doing is making offers to each other, then we have the problem that “cross-offers are not acceptances of each other”\(^4\). Put simply, an offer may be automated (for example, unilateral offers made on e-commerce websites, where it is widely acknowledged that offers may be automated and therefore made without the original "offeror" having express knowledge of an individual offer), but valid acceptance, as English Law stands, requires an act of human will. As a matter of legal theory, conduct only constitutes acceptance where that conduct is clear objective evidence of the fact that the accepter has made the necessary act of will to enter into the contract. If on the facts the accepter is ignorant of the very existence of the offer at the time it is made, this condition cannot be satisfied.

This analysis leads in a profoundly uncomfortable direction. If there is no acceptance at the time of the contract, then, in theory, there is no contract, and indeed it has been said that "there is a very strong argument for the unenforceability of algorithmic contracts”\(^5\). On this basis, the best analysis of what trading algorithms get up to at night when there is no one around is merely teeing up mutual offers, with acceptance occurring only when a human being comes into the office in the morning, reviews what the

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\(^3\) *Thornton v Shoe Lane Parking Ltd* [1971] 1 K.B. 532.

\(^4\) *Tinn v Hoffman & Co.* (1873) 29 L.T. 271, 278, and see Chitty, 2-043.

\(^5\) Algorithmic Contracts, L Scholz, 20 Stan Tech L. Rev 128 (2017) at p.151. The solution Scholz proposes – that programs be regarded as agents for their principles – does not help as regards the problem of mistake, since where an agent makes a mistake in deciding whether to enter into a contract for his principal, it is the state of mind of the agent which must be tested.
algorithms have done, and indicates acceptance of such offers. Such an analysis would be absolutely contrary to the beliefs and expectations of those engaged in this sort of trading, and cannot be accepted. There is surprisingly little academic analysis of this problem.

This point was elided in the most recent case involving computers dealing with each other – Quoine – by the Singapore Court of Appeal (with the exception of Mance LJ dissenting) deciding that the contracts concerned could be said to have been "made" when the automated trading programs concerned were set in motion. This apparently nonsensical conclusion was reached because the facts of the case turned on the doctrine of mistake, and in order to apply that doctrine, it was necessary, following The Great Peace⁶, to establish whether the relevant mistake was operative when the contracts were entered into. By holding that the contracts were, in effect, entered into when the programs were set in motion, the court was able to conclude that the test for mistake should be applied at that point. However, that argument can be challenged. It seems illogical to argue that a party has accepted an offer before that offer is made, at a time when the party has no idea what offers may be made, or by whom. It could be argued that at best any such contract would be a contract to contract, and although such contracts may sometimes be enforceable at law, this will only happen where the terms of the future contract can be ascertained⁷.

In response it may be argued that where a program purports to accept an offer made by another program, then acceptance could somehow be referred back to the act of the program owner setting the program in motion in the first place, due to the nature of code meaning that it will follow the specific instructions given. The developers of any smart contract acting in this way would have necessarily envisioned scenarios where they wanted the program to act, and outlined limits and boundaries as to how it should do so. For example, conditions for acceptance of an offer may be specifically built into the program using if/then programming. The expectation would be for the code to act in every situation where it can under those defined limits, and so it could be argued that the very act of starting the program and letting it run could be an external manifestation of consent. The challenge comes with certain complex 'black box' algorithms, where it is not possible to know which terms or conditions the algorithm will select in advance, and it may not always be straightforward or even possible to determine the exact basis on which the algorithm made any particular decisions. If at the time that the programs were set in motion the terms of any future transactions were both unknown and unknowable, this cannot be the correct analysis as the law currently stands. One solution therefore may be for legislation to be enacted that would allow the acceptance of an offer before it has been made or for mutual unilateral offers to produce a contract, in certain specific circumstances where it is clear from the actions of the parties that this is intended.

Another possible solution to this problem would be to accept the idea that no contract is ever made, but because of their conduct the parties are estopped from denying that fact, and must proceed as if they had in fact contracted. This should be rejected – not least because such an estoppel only operates between the parties to the transaction. In a conventional trading situation, where A sells Z to B, who then sells it to C, if A proceeds against C directly for the recovery of the goods, C cannot rely on an estoppel available only to B. E-commerce does not operate on this basis – it operates on the basis that a transaction is a transaction, and that the rights and liabilities of the parties arise at the moment when the transaction is entered into the system. The conclusion that what appear to be transactions concluded within the system are not in fact transactions at all is radically incompatible with the intentions of the users of such platforms.

This is, of course, only one instance of a widespread problem, that people generally are apt to act with the most callous disregard for legal technicalities in their personal and commercial transactions. There is, as Chitty ruefully notes⁸, a significant gap between the technical legal analysis of offer and

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⁷ Chitty, 2-143.
⁸ Ibid, para 2-118.
acceptance and the modes of dealing of quite significant sections of the commercial world. This has, from time to time, led the courts to take a robust line that where the correspondence as a whole and the conduct of the parties show that they believe that they have made a contract, they should be treated as having done so, regardless of the presence, or absence, of an identifiable offer or acceptance. However, as Chitty goes on to say, "such an outright rejection of the traditional analysis is open to the objection that it provides too little guidance for the courts (or for the parties or for their legal advisors) in determining whether an agreement has been reached... This approach is supported by cases in which it has been held that there was no contract precisely because there was no offer and acceptance".

In this regard, the position of the Singapore authorities is on the conservative side – in *Gay Choon Ing v Loh Sze Ti Terence Peter*, the Singapore Court of Appeal said on this point:

"Whilst it is true that the court concerned must examine the whole course of negotiations between the parties (see above at [53]), this should be effected in accordance with the concepts of offer and acceptance. What is required, however, is a less mechanistic or dogmatic application of these concepts and this can be achieved by having regard to the context in which the agreement was concluded."

An alternative view expressed by certain academics is that algorithms (often referred to as "software agents" or "electronic agents") could be conferred with some degree of legal personality, which would mean they effectively act as constructive agents for the principal contracting parties they serve. Under this analysis, a computer program could enter into a legally binding contract, relying on the law of agency for its validity. It has been argued that a software agent performing a smart contract for its principal with no human intervention should be akin to a human agent performing the same task, and thus should be treated equally to the human agent under the law. This would provide a basis for enforceability of smart contracts that solves the question of consent and contract validity by integrating with existing legal theories about contractual freedom and conclusion of contracts. However, this theory does pose difficulties in justifying the attribution of legal personality to an automated entity based on at least three considerations: moral authority, social capacity and legal convenience (which are effectively impossible with computers). In addition, ultimately the law of contract would also need to account for additional concerns as to the assignment of liability, including who would take responsibility for algorithmic outcomes accomplished in a way that algorithm creators could not have predicted. It would also need to appropriately address the mistake concern referenced above, i.e. that where an agent makes a mistake in deciding whether to enter into a contract for his principal, it is the state of mind of the agent which must be tested, which is not possible with an electronic agent.

It seems to us that what is needed here is a confirmation of the fact that at English law an interaction between two computer programs occurring without direct human intervention, which is intended to result in a legally enforceable arrangement to transfer rights or property, may be enforceable as a contract in the same way that it would have been had it been entered into as a result of human interaction. This is not a case of redesigning the law of contracts. Smart contracts aim to translate a process currently undertaken by humans into something that can be performed mostly by machines. This reflects a change in method, not a change in the nature of contracting.

This, of course, gives rise to exactly the problem that Lord Mance raised in *Quoine* – what should the position be where the computers act in a way in which it is clear that no human being would have acted and/or is contrary to the intentions of those who set the programs in motion? Should the actions of a

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10 Ibid, para 2-119.

11 [2009] SGCA 3 at [63].

computer be subject to some sort of "reasonableness override", such that where a computer does something which is so plainly erroneous that a human being would immediately recognise it as such, there should be a remedy based on that fact alone. We are inclined to agree with Lord Mance that a development of the Coys of Kensington\(^\text{13}\) principle (that a person who receives a benefit by mistake should reimburse the value of that benefit to the other party if it is readily returnable without substantial difficulty or detriment) would satisfactorily address this issue. However, these positions are – properly – left to the courts. What cannot be left to the courts is the fundamental uncertainty which arises from the potential unenforceability of computer contracts under English law. This should be clearly addressed.

2. **Reversibility of performance**

The second key issue for automated contracting between two computer programs is the question of the consequences of a subsequent challenge to such a contract once made.

Where a contract is made between two pieces of software, it is generally executed immediately and automatically. However, such instant execution is only useful if it has some sort of settlement finality protection where the underlying transaction remains valid even if the contract pursuant to which it has been effected is challenged. This idea is sometimes summarised as the notion that "the code is law" – that is, that what is done through code should be irreversible. These protections are currently not widely available outside specific financial markets contexts, although DLT-based smart contracts may bring certain additional practical difficulties for unwinding a contract.

The utility of a legal provision of this kind can be illustrated with a simple example. Imagine two businesses, both of whom operate entirely automated warehouses. A thief hacks into the software of one of the companies and gives an instruction for certain goods to be delivered to the other business. The contract is void (or voidable), but the goods are nonetheless delivered. The other business sells the goods automatically to third-party buyers. The combination of the initial contract being void or voidable and the rule of nemo dat means that those third-party buyers cannot be sure that they have legal title to the goods that they possess. The question of equitable title is equally difficult - the fact that all transactions are automatic, with no human involvement, also raises the question as to whether good faith can be established merely by demonstrating lack of bad faith.

These issues were litigated in Singapore in Quoine\(^\text{14}\). In that case, it was established that, if a contract made between dealing programs was void for mistake, the transfers of property made pursuant to that contract would be reversed. The Court of Appeal was faced with the difficult choice between upholding the validity of a contract which was clearly mistaken, or retrospectively reversing executed contracts.

The issues arising when a contract is retrospectively voided are an extreme example of this problem. However, they also arise in a number of other, less extreme, cases. For example, what is the position if what that piece of software does is demonstrably incompatible with the terms of the contract? In particular, if a contract is for the sale of A, but the software transfers B, should that transfer be extinguished?

The essence of the cyber-purist view is that it should not. The idea that "the code is law", reduced to legal concepts, is precisely that what is done automatically and without human intervention by a program should not be capable of being reversed or varied because of human intervention. The use of "immutable" DLT technology underlying a smart contract may lend weight to this argument, although there are ways to address this. However, with a few exceptions, this is not currently possible under English law.

It is instructive to begin by considering the exceptions. The simplest is the case of real estate. A transfer of real estate is done using two documents: a contract and a conveyance. Because the conveyance is

\[\text{13} \quad \text{McDonald v Coys of Kensington (Sales) Ltd [2004] EWCA Civ 47.}\]

\[\text{14} \quad \text{Quoine Pte Ltd v B2C2 Ltd [2020] SGCA(I) 02.}\]
executed as a deed, it has a legal effect which is independent of the contract by reference to which it is created. Thus, the avoidance of a contract for sale of real estate does not itself void a conveyance of that real estate. A similar outcome can be produced in several other situations. For example, where two parties contract that a bill of exchange shall be created, and such a bill is created, the bill itself is valid regardless of any subsequent challenge to the relevant contract. Further, as mentioned above, the settlement finality regime as it applies to financial contracts has the effect of preserving certain transfers of financial assets in the face of challenge to the underlying contract.

The problem is that, outside these identifiable exceptions, English law is incapable of separating contract and conveyance. This is in contrast to other legal systems – in German law, for example, the principles of separation and abstraction have the effect that a rescission of a contract does not itself affect the validity of a transfer made under it. At English law, if a contract is voided, the transfer made under it is equally voided and, in a contract which is not subject to special rules, this will be true whether or not the transfer of property is separately documented. For example, where a contract for the sale of a ship is documented using a bill of sale to transfer ownership of the ship, the bill of sale does not have independent legal effect, and derives its legal consequences entirely from the contract pursuant to which it is made.

The basic legal proposition is lucidly set out in the "Legal Statement on cryptoassets and smart contracts" of the UK Jurisdiction Taskforce. This correctly states two important preliminary points. The first of these is that the use of software cannot produce legal obligations between persons other than through the operation of the law of contract. The argument that the use of software giving rise to automatic outcomes means that there is no need for a party's obligations under a smart contract to be legally enforceable is nonsense – if only because property transferred otherwise than under a legal contract can be recovered back. The second is that, once it is understood that the relationship between the parties to a smart contract must, in law, be a contractual relationship, then there is no good reason for treating smart contracts as being different in principle from conventional contracts.

This is the crux of the issue between the conventional legal analysis and the view of the cyber-purists. In this context, when the cyber-purists say that they want a world in which "the code is law", what they mean is that they want a transaction effected through a software operation to be recognised as valid regardless of whether the contract pursuant to which the transaction is effected is challengeable or challenged.

It is insufficient to reply to this by saying simply that this is not the law as it stands today. The question is whether the law should accommodate this. Settlement finality has been accorded to other types of transaction in other contexts, and there is nothing in the idea which is inherently repugnant to English law.

One way of approaching this might be to ask whether what we need is simply an extension of the existing law of bills and notes to payment instructions embedded in software programs. However, this would underestimate the scope of the problem. The law of bills and notes is, by definition, restricted to payments. The role of software is not so limited. For example, imagine a situation in which two software programs have purported to enter into a contract with each other. One of them sends a software instruction to make a payment, the other sends a software instruction to deliver whatever it is that has been sold. It would be absurd to conclude that the outcome of the operation of one piece of software should be challengeable, whilst the other should be protected. If protection of this kind is to be extended to certain actions which are the outcome of the operation of a type of software, it would be absurd to suggest that that protection should not be afforded to other such actions, without producing at least a coherent theoretical basis for that distinction. The fact that one relates to money, whilst the other relates to things, is not an adequate theoretical basis in this regard.

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15 Published in November 2019 and available at https://technation.io/lawtech-uk-resources/
16 See paras 136 – 148.
As between the parties, there is a simple solution – the intention of the parties. However, the question with which we are concerned here is the position as regards third parties. Assume that three trading programs are interacting with each other on an exchange. Trading program A sells Z to trading program B, which in turn sells it to trading program C. Can program C safely sell Z to program D? That depends on whether the transaction between A and B is valid. Can C determine whether that transaction is valid? With the law as it stands today, the answer is no.

Viewed from this perspective, it seems clear that the promotion of market efficiency weighs heavily in favour of the creation of some sort of protection for transactions where the universal expectation is that transfers should not be reversible. However, such provisions have traditionally been confined within narrow bonds, on the basis that it is important that it should be entirely clear both to the contracting parties and to third parties what the rules are which apply to any particular transaction. With bills of exchange, for example, the very exact rules as to the content and form were imposed precisely in order to try and create a clear division between instruments which were enforceable as bills and instruments which were not.

It is our view that a degree of protection should be afforded by law to payments and transfers made through the operation of software where the circumstances of the contract are such that it is clear both to the parties and to the world at large that that is the common intention. Strict "code-is-law" supporters would argue that the mere fact that a contract has been set up to be fulfilled by software is itself sufficient evidence of this. We do not agree. We think that, in the same way that settlement finality protections are only available under the existing legislation for certain types of transaction identifiable as such, a similar regime should be put in place such that it should be clear when a particular arrangement is intended to be final in this way.

Finally, we note that the availability of settlement finality protections does not necessarily significantly reduce the rights of the parties. In securities transactions, for example, a party who has lost out by reason of a mistaken transfer may sue for damages for breach of contract, or for compensation in unjust enrichment, or potentially under a number of other causes of action. The introduction of a degree of protection for transactions of this kind need not necessarily result in any diminution of the rights of any person.
Chapter 2: What is a smart contract?

Question 1

Please share your views below:

First of all, we classify contractual clauses into two different categories. 1- Operational clauses and 2- Non-operational clauses. From our perspective, operational clauses are the ones that can be coded with the current technology and do not require a human interpretation. Operational clauses include monetary values, rates, dates, addresses, identifiers (names of companies or individuals). Anything beyond that falls under the non-operational clauses such as best effort, fairness, etc.

We believe that any obligation referring solely to operational clauses could be automated. For example, Party A will pay (certain amount) to Party B on the last Thursday of each month until this contract is terminated. These obligations do not necessarily are limited with monetary terms. They can also cover release of information, change of title, etc.

Question 2

Please share your views below:

Yes, we agree with your scoping due to the fact of smart contracts running on DLT systems not relying on a single party's mercy for their execution.

Question 3

Please share your views below:
permissioned DLT systems?

Where data privacy is a major concern. Other concerns might include secrecy. For example, we cannot expect an institution (knowingly) facilitating unlawful transactions using a permissionless DLT system. Also, for transactions where the ultimate beneficial owner prefers to be hidden (e.g. will, donations, systems related to healthcare, voting systems. Cases where contracting parties do not want any stakeholder to be aware that they are collaborating with.

permissionless DLT systems?

I believe that in the absence of the above mentioned concerns, it is better to use a permissionless DLT. Any concerns related to energy consumption will be overcome soon once the public networks start to move towards to proof of stake consensus mechanisms

Question 4

Not Answered

Please provide examples of how these forms of smart contract have been used in practice:

In our experience, a contract that is recorded solely in the code of a computer program (3), is currently the most common form when utilising smart contracts. We have also noted limited instances where a hybrid contract (2) is utilised.

An example of a smart contract in the form of solely code is smart contracts governing or acting as digital assets representing financial assets such as bonds.

An example of a hybrid contract is something we worked on in the past which we refer to as “Smart NDA”. Smart NDA is a smart contract representing a non-disclosure agreement signed between two parties. In the current form of paper contracts, there are no mitigating controls for disclosing or receiving party to refer to the confidential information at the time of signing a contract. Normally, the process involves both parties signing an NDA where the receiving party has almost no idea of the information that will be disclosed. In the case of a Smart NDA, disclosing a party creates a smart contract that also includes confidential information in an encrypted form. Smart contract reveals confidential information (decrypts) once the receiving party signs the contract (i.e. smart contract in a hybrid form). This way both parties have the ability to prove that the revealed information in case of a dispute in future.

Question 5

Please share your views below:

Referring to our response to Q4, natural language clauses (i.e. confidential information) acts as data within a hybrid smart contract.

Question 6

Please share your views below:

Question 7

Please share your views below:

Question 8

Please share your views below:

Chapter 3: Formation of smart contracts

Question 9

Please share your views below:

Question 10

Please share your views below:

We are aware that Clause (https://clause.io/) and Monax (https://monax.io/) are working on developing common programming languages enabling its users to develop legal smart contracts

Question 11

Please share your views below:

Let's assume that Party A and Party B is entering into a legal contract by deploying a smart contract on a DLT system. And such a contract is deployed by Party C who acts as an infrastructure (i.e. technology) provider. Also, let's assume that the smart contract is only legally binding after its deployment to the blockchain. In such a scenario, we can replicate offer and acceptance by using a utility token. This token could be either fungible or non-fungible. Stages are:

1. Party A and Party B agree on a draft contract or terms where Party C develops a smart contract that represents those terms
2. Party C deploys the smart contract to the blockchain
3-Party A (offering party) sends a token to the smart contract which initiates a transaction.
4-Smart contract sends a notification to Party B (agreeing party). If Party B sends a token to the smart contract, such an action could represent acceptance of the offer.

*In this case tokens will not have any assigned value. Alternatively, tokens might have assigned values that will be diverted to Party C after the acceptance. This way Party C will be receiving a fee in exchange for the services provided. In such a case, the number of tokens could depend on the complexity of a contract which is similar to a real-life case (e.g. law firms and their clients)*

**Question 12**

Please share your views below:

Such a case is pretty common for DeFi where parties are unlikely to be able to identify each other.

**Question 13**

Please share your views below:

In a case of a private network, it should be straightforward to identify the parties as identification would be performed during the onboarding. In a case of a public network, wallet addresses or IP numbers could be used to identify parties. Also, if the agreement is referring to a certain asset, I would expect that at least one of the parties should have a form of ownership on the asset which will make the identification process possible.

**Question 14**

Please share your views below:

**Question 15**

Please share your views below:

**Question 16**

Please share your views below:

**Question 17**

Please share your views below:

**Question 18**

Please share your views below:

**Question 19**

Please share your views below:

**Question 20**

Please share your views below:

**Question 21**

Please share your views below:

**Question 22**

Please share your views below:

**Chapter 4: Interpretation of smart contracts**

**Question 23**

Please share your views below:

In a case of a hybrid contract, any deviation of execution of code from the natural language clauses (in a case where both are visible within a smart contract), a dispute may arise. Therefore it should be clear to the parties which version will be the main one (e.g. a similar example would be dual language contracts signed between parties where the main version of the contract is defined among the terms)

**Question 24**

Please share your views below:
Please refer to our response to question 23

Question 25

Please share your views below:

3 - functioning computer

Question 26

Please share your views below:

I consider that performance of the coded terms of a smart contract cannot always be predicted based on a reading of the code. This is basically due to the nature of how code works where actions including multiple steps can create a large number of outputs. For example, our code includes steps such as A, B, C which are required to be performed in the same sequence. In this scenario, let’s say we identified three options for each stage. It means that the code could create 27 (3*3*3) different outputs (i.e. different ways of reaching an end). The challenge arises when parties cannot ensure the completeness of options. In the same example, there could be one more option that we didn’t manage to identify (e.g. B4). The existence of B4 will lead to 9 more outputs which we didn’t foresee at the inception stage.

I believe that the performance of the coded terms of a smart contract cannot always be predicted based on a reading of the code. This is a common practice within the software and one of the underlying reasons for bugs.

Question 27

Please share your views below:

One method I would propose is running the code on a test network by using an agreed set of data. This way it could be possible to ensure where the code creates outputs other than intended. This process would function similar to how rainbow tables work while hacking a computerised system.

Question 28

Please share your views below:

Contracts as whole, considering the question is referring to an hybrid contract.

Question 29

Please share your views below:

Question 30

Please share your views below:

Chapter 5: Remedies and smart contracts

Question 31

Please share your views below:

Question 32

Please share your views below:

Question 33

Please share your views below:

One method I would propose is running the code on a test network by using an agreed set of data. This way it could be possible to ensure where the code creates outputs other than intended. This process would function similar to how rainbow tables work while hacking a computerised system.

Question 34

Please share your views below:

Question 35

Please share your views below:

Question 36

Please share your views below:
I believe there are a couple of challenges around effective enforcement of the illegality doctrine.

1. Who is going to decide the illegality of a smart contract?
2. In the event of such a conclusion, how will the deciding authorities block operations of a smart contract? (e.g. many distributed systems are free from the governance of legacy authorities)
3. In many cases, it is likely that any decision on illegality will follow the execution of terms. In the case of conventional contracts, parties have the option to stop following the agreed terms whereas, by definition, they will not have such an option in the case of a smart contract.

Chapter 6: Consumers and smart contracts

Similar to Axa’s Fizzy, https://etherisc.com/ developed insurance contracts for flight delay compensation.

It depends on the systems that are relevant to a contract. Smart contracts could ease the process if the infrastructure used (or relevant) to the purpose of a legal contract is either on a blockchain or capable of communicating with smart contracts via oracles. For example, currently using smart contracts during a sale of a property would not bring material benefits to stakeholders. However, once HM Land Registry decides to move its records to a blockchain solution, then using a smart contract would be more feasible for consumers.

In the case of a hybrid or sole code smart contract, consumers might claim that actions of a smart contract are “contrary to good faith”. Such a claim could be supported by (1) terms not being expressed fully, clearly… and (2) consumers have been unfamiliar with the technicality of smart contracts which deprived its capability of bargaining.

Chapter 7: Jurisdiction and smart contracts

Using the example defined under paragraph 7.22 another layer of challenge would occur if parties use digital wallets to interact with smart contracts (i.e. blockchain). In this case, additional consideration regarding the custodian of the digital wallet needs to be made. Because providers of digital wallets could be located in a location other than both Alice and Bob.
Yes, assuming that the state law referred to in the question has not comprehensively covered the actions of a smart contract or not clearly guiding the parties on the legal path they should follow.

This could be tricky as it is not always possible to identify the nodes executing the relevant code within a smart contract.
D2LT Response

Law Commission’s Call for Evidence on Smart Contracts
dated 17 December 2019
This paper sets out the views of D2 Legal Technology (“D2LT”) on the Law Commission’s Call for Evidence on Smart Contracts published on 17 December 2020 (the “Call”).

D2LT is a legal data and change consulting firm, sitting at the intersection of FinTech and LegalTech. With offices in London, Frankfurt, New York, Charlotte, Hong Kong and Sydney, it provides inter alia, strategic advice and implementation services to c. ten leading investment banks and various other financial firms on the digitisation of legal agreements and opinions. This has assisted its clients in the areas of resource management (such as capital, liquidity and collateral), regulatory reporting and compliance (such as qualified financial contract reporting (often colloquially known as “living wills reporting”), client assets and money compliance and ECB close-out netting reporting) and operational management.

D2LT’s work has included leading document and legal opinion digitalisation programmes for major trade associations in the capital markets industry, such as the International Swap and Derivatives Association (ISDA) and the International Securities Lending Association (ISLA). This has included creating for these clients, an industry Clause Taxonomy and Library for their published master agreement documentation, which is regarding as an important stepping-stone and legal agreement data standard to facilitate the use of smart contracts in the OTC derivatives and securities lending industries respectively.

As part of our engagements at major investment banks to set up and provide expertise to LegalTech and Legal Innovation teams, we have been involved in a number of Smart Contracts projects over the last two years.
D2LT look forward to discussing the impact of changes to the law with regards to creating a positive, safe and certain legal framework for smart contracts to develop as part of this response. We hope this will mark the beginning of an ongoing dialogue as the Commission prepares its scoping study and develops its thinking in this area.

Instead of using the Commission template, we have structured our response to reflect our analysis of the main issues raised by the Call for Evidence. In so doing, we have regrouped the questions in line with our feedback.
Executive Summary

The law is usually regarded as being reactive to new technologies. It is rooted in conservatism and a desire for certainty and it rightly does not seek to stifle technological innovation. More importantly, innovative technology does not necessarily necessitate innovative jurisprudence. We believe this is especially true in the case of smart contracts, where we believe there be little need for changes to changes to the existing legal framework. Rather, we believe smart contracting development, practices and practicalities of any meaningful use needs to mature. This will itself help to ensure the correct application of a legal framework to support smart contracts advancing commerce and broader societal needs.

There are a multitude of different types of distributed ledger technologies and configurations of them. Any statement of the legal analysis regarding distributed ledgers should be qualified with references to its specific features and its intended use. The same legal principles extend out to all distributed ledgers – however, this can result in needless concerns regarding the function the law performs to help commerce and fairness, given many considerations will fall away in respect of idealistic yet impractical types of distributed ledgers. We primarily refer to public blockchains in this regard, where participants operating the nodes are pseudoanonymous, which results in difficulty in holding them accountable, verifying their trustworthiness, establishing intent and a reputational history. They revive earlier associations of equality and devolution of power with the beginnings of the Internet, with anarchistic-capitalistic and anti-authoritarian attitudes.

The main benefits of smart contracts relate to their automaticity, and an ability to link performance in systems and data to the recording of contractual obligations.

Public distributed ledgers are tenable for basic automation, however impossibly hard for complex automation where all scenarios may not be envisaged and there is a need to address “automation gone wrong”. In addition, public blockchains have the concept of universal transparency so that the contents of the distributed ledger are visible to all. This concept was originally to fix the double spend problem, but in significant transactions, contradict the need for confidentiality and privacy.

In respect of private blockchains, identities of nodes are known, so they can rely on less computationally intensive consensus algorithms as the system needs not be so “trustless”. This positively impacts speed, scalability and creates an ability to change the rules or even reverse transactions, allowing where relevant, for the legal framework to more usefully intervene where automation has not occurred as intended.

We believe that most legal controversies and practical problems concern public blockchains as they can be characterised by a strict adherence to certain technical features, such as decentralisation and anonymity, as well as the seeming absence of legal terms (perhaps supposedly desired by participants) regulating their use.

The main thrust of our response therefore seeks to practically suggest best practices that allow for the evolution of smart contracts in the private distributed ledger context.
These allow the legal framework to intervene where necessary, without disturbing the main benefits of smart contracts to bridge the gap between contract law and the increasingly prevalent use of systems and data in today’s world, linking the recording of contractual obligations with the systems that increasingly perform the actions detailed in those contractual obligations by parties, through the medium of data.

We believe that the use of the terms “natural language” and “code” need to be considered at a more nuanced level than that provided in the Call. In particular, high-order programming languages (such as Solidity in the context of smart contracts) should be considered as more similar to traditional natural language contracts (for example in their appearance as abbreviated English sentences). In fact, we view that they ought to be considered in light of the free choice of contracting parties to write down their agreements in whatever form and whatever language they want, be it English, French, a dead language such as Latin – or indeed a higher order programming language².

We query whether too much of the focus has been in anticipation of bilateral contractual relationships of the kind that gave rise to bilateral disputes which were generally between parties in a ‘silo’, and not enough attention to the kind of challenges posed by common coding and software/libraries widely used in as a community, which may present different challenges, in the way that long-term standard relational contracts have sometimes done, that in turn call for a different jurisprudence³.

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² Noting the limits to this in a business to consumer context.
³ Noting the considerations in: Stephen J. Choi & G. M. Gulati, Contract as Statute, 104 MICH. L. REV. 1129 (2006). Available at: https://repository.law.umich.edu/mlr/vol104/iss5/10
**Scope – definition of smart contracts**

1. Given that this is a new and maturing area of law, we recommend that the Law Commission adopts a broader definition of “smart contract” than is contained in the Call for Evidence. We suggest that a more complete and wide-ranging debate could be developed if there was a broader view of what is constituted by a smart contract. We believe this should incorporate a view of smart contracts in line with current usage and with the Law Tech Law Tech Delivery Panel (LTDP)’s definition as set out in its Statement of November 2019.4

2. We believe this to be a more useful point of departure given the adaptability of English and Welsh law, and the benefits such a technology-neutral definition could bring to future proofing legal questions regarding smart contracts.

**Question 2.**

Do you agree that the Law Commission’s scoping study on smart contracts should be limited to contracts which use distributed ledger technology? If not, please provide details of other technologies which are used to support smart contracts, and their prevalence.

3. We do not see the benefit of limiting the definition to distributed ledger technology based smart contracts, and are not aware of other technologies that would significantly alter the basic discussion.

4. We consider that the Law Commission definition of “smart contracts” in this Call for Evidence is very conservative, given this is a very new and still maturing area. Instead of developing a strict smart contract definition, the LTDP opted to identify distinctive features of the most pervasive smart contracts without seeking to restrict the phrase to any particular set of features.5 For example, they identified automaticity as the ‘characteristic feature’ of smart contracts. In the Panel’s view, smart contracts are ‘performed, at least in part, automatically and without the need for, and in some cases without the possibility of, human intervention’, thereby requiring the terms of the contract to be recorded in code.

5. In particular, we believe that this automaticity should be defined in the context of linking the recording the terms of agreements between parties, with the systems performing the contractual obligations of such agreements, or data that represents key elements of the performance of such contractual obligations.

6. We believe that it is imperative that one does not introduce any concept of artificial intelligence (AI) into the definition or necessary features of a smart contract (despite the deceptive use of the word “smart” in “Smart Contract”).

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4 LawTech Delivery Panel, Legal statement on cryptoassets and smart contracts (November 2019)

5 Legal statement on cryptoassets and smart contracts, page 135
Use cases for smart contracts

Question 1.

What kinds of contractual obligations can currently be automated using computer programs? Please provide specific examples where possible.

Our understanding is that currently, the production level use of smart contracts is mostly limited to payment and title transfer obligations, where these can be linked to simple conditions that can expressed in Boolean logic. It is this simplicity of obligations that has also allowed the ideological advantages of public distributed ledgers to be considered.

More complex smart contract contractual obligations are being developed but many are in experimental / proof of concept stage. These rely on oracles, for example, to allow the input of real world inputs, including a representation of statuses of real-world assets and expressions of human judgment. It should be noted that they gradually diminish levels of true automation (or straight-through-processing), but in our view, are required.

We note that there is also the increased exploration of multiple oracles (even in respect of the same data variable input), allowing the development of consensus (e.g. to obtain an indication of a market value by polling four dealers for a price).

The focus should perhaps be less specifically on actual automation, but linking systems and data to specific records of contractual obligations. Although it is often said that smart contracts are less appropriate for relationship level agreements (such as the ISDA Master Agreement), and more appropriate to specific (one-off) transactions, such as individual trades, we also see this as a gradual evolution in the more digital legal contract framework.

Question 3.

When, and why, do parties to smart contracts decide to use: (1) permissioned DLT systems. (2) permissionless DLT systems.

We believe that there is little genuine productionised and commercial use of permissionless DLT systems outside of purely on-chain transactions (e.g. ICOs). In order to be recorded in the virtual world, real events must be translated in virtual inputs, while in the real-world events happen independently from what is recorded in the blockchain. Off-chain events must therefore be translated into virtual inputs to become on-chain events. Leaving aside ideologies such as decentralisation, avoiding the need to trust authorities such as governments and regulators and complete transparency, the need to link to real world assets and recourse to a counterparty when automation fails to meet expectations, means that we believe that the use of permissionless DLT systems have, in the context of smart contracts, very limited future growth.

Question 4.

Which of the three forms of smart contract discussed in para. 2.32 of the call for evidence are most commonly used in existing smart contracts or smart contracts which are in development? Please provide examples of how these forms of smart contract have been used in practice.
We believe that the use of the terms "natural language" and "code" needs to be considered at a more nuanced level. A distinction needs to be drawn between code that is written in a higher order programming language (such as C++ and Java, and in the context of smart contracts, Solidity), and lower level (e.g. assembly/object code). Higher order programming languages are designed to be read by people (albeit with a background in software development) and, we believe, should be treated as closer to natural language (as defined), and perhaps considered more like a foreign language.\(^6\)

This can be imagined on a spectrum – contracts fully in natural language at one end and in fully coded higher language computer programming language at the other end (noting we ignore assembly code from this spectrum as not really written or reviewed in this form, rather it is compiled into this form).

There are an increasing number of “no-code” solutions in the market, some of which could be used to generate smart contracts\(^7\). Of course, while there is code in them, they do not require coding experience to use them. For the user they are more akin to natural language (albeit sometimes presented through more of a wizard approach akin to, for example, the step-by-step assistance given through the graphical user interface when creating a pivot table in modern versions of Microsoft Excel).

We note the consideration by Frantz and Nowostawski regarding authoring smart contracts from a subject matter expert’s perspective by proposing a semi-automated method for the translation of human readable contracts to smart contracts on Ethereum (via a domain specific language using plain English expressions that are then automatically translated into Solidity).

D2LT’s work in respect of creating a clause taxonomy and library for the ISDA Master Agreement and also ISLA’s GMSLA\(^8\) also represent initial steps to facilitate the easier linkage from natural language to business concepts and to the performance (in systems through data) of contractual obligations.

We note that there is a three-step evolution in respect of smart contracts:

1. Natural language contract with links to payment mechanism
2. Natural language contract with links to performance mechanism
3. Contract entirely in code (where the payment and/or performance mechanisms are within the code that constitutes the contract)

Not all of the contractual obligations in a contract need to evolve along this maturity model at the same time. Most smart contracts contractual obligations are in step 1 at the moment, with a few examples of step 2. We will increasingly see the linkage of multiple smart contracts together. At that point, we may see smart contracts rapidly progress to step 3, which will lead to better and more usefully complex contractual obligations in smart contracts (utilising a modular architecture to allow their design and development to scale).

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\(^6\) Note also the view expressed by many leading AI/logic academics, that "we need to stop teaching humans to think like computers; we need to teach computers to think like humans" (Professor Robert Kowalski & his work on Logical English, seen here in an academic paper with Akber Datoo in the context of the ISDA Master Agreement e.g. https://www.doc.ic.ac.uk/~rak/papers/Logical%20English%20meets%20Legal%20English.pdf).

\(^7\) For example, Unibright the creation of DAML smart contracts with “no code” developer tools (https://blog.digitalasset.com/press-release/unibright_daml)

\(^8\) https://d2legaltech.com/insights/legal-clause-library-legal-data-standards/
Question 5.

How do code and natural language interact in hybrid smart contracts currently in existence or in development and which terms are generally coded?

We believe the role of libraries in the code should not be underestimated. Software development uses precedent code libraries much more than would be the case in natural language contract drafting. Software developers will likely rely on natural language descriptions of what particular libraries offer, combined with experience of their usage. We recommend the increased usage of natural language in higher order programming language code as comments should also be considered. These are typically used by reviewers of code as a guide to what the code section is intended to do (and to the extent they are not utilised, should be regarded as poor practice in the same way that drafting without appropriate section headings and thought for readability would be considered so).

When considering comments, labels and other markers within code, it may be useful to consider parallels such as Burton J in Citicorp International Limited v Castex Technologies Limited, 24 February 2016. In this case, Burton J commented that he would "... find it impossible not to be assisted" by the heading to Condition 8.11 even were clause 1.3 of the trust deed to apply. We note his reference to Doughty Hanson & Co. Ltd v Roe [2007] EWHC 222 (Ch), where Mann J determined the relevant clause was admissible "as descriptive of what the provision is about". This could support the proposition that code comments may be used as an interpretive aid, as well as assisting with determining the intention of the parties.

Question 7.

Are you aware of any examples of use cases for smart contracts beyond those we give in the call for evidence, or variations on the use cases we give, which are being developed, at proof of concept stage or already operational?

If so, please explain:

(1) the technology used to create the smart contract;

(2) the role played (if any) by oracles in the performance of the smart contract;

(3) the contractual terms (if any) performed automatically by computer programs; and

(4) whether the smart contract is a business to business commercial contract, a peer to peer contract or a business to consumer contract.

Commercial contracts contain numerous boilerplate clauses that protect contracting parties from different edge-case liabilities. These clauses it is claimed are not always suitable for representation and execution as code. However, we see a growing use of oracles & multisig functionality that addresses this (especially in the case of private blockchains, rather than public distributed ledgers).

For example, a machine of itself has no way to assess whether a party has used “best efforts”. We have seen attempts to list out what this might mean, however, with real-life

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9 In the context of smart contracts, these are available for example through the Accord Project.
commercial transactions, this can be futile (and dramatically increase the pre-contacting costs for parties), resulting in the use of oracles to provide for this, with necessary assumptions to need a proactive step to trigger such actions.

Question 43.

Are you aware of any business to consumer smart contracts currently in use or in development? Please give details.

Question 44.

When would you estimate that smart contracts might be in common use in business to consumer contracts?

We expect this to be c. 3-4 years away. The increasing acceptability of cryptocurrencies, through actions such as the recent investment by TESLA in bitcoin\(^\text{10}\) has accelerated this timeline due to the mainstream acceptability this has given to distributed ledger technology, although smart contract best practices need to considerably mature to facilitate their use in business to consumer contracts.

\[\text{10} \text{https://www.sec.gov/ix?doc=/Archives/edgar/data/1318605/000156459021004599/tsla-10k_20201231.htm}\]
**Benefits of smart contracts**

**Question 8.**

What benefits and cost savings can smart contracts provide compared with traditional contracts? Will increased use of smart contracts lead to any additional costs? Please provide details and any available qualitative and quantitative evidence.

We see the benefits as: speed of execution/automated execution; automated performance and monitoring; increased transparency and visibility; increased certainty in relation to final form of contract (as codified); and, reduced "performance risk" on a counterparty. Smart contracts are therefore beneficial versus traditional contracting where the parties seek to reduce the opportunity for their counterparty to engage in opportunistic behaviour and “efficient breach of contract” due to the consequences this might have on them commercially.

Cost savings for smart contract users are a benefit, however, for many users, this is de minimis compared to the benefits offered by smart contracting in respect of additional business value they provide regarding optimisation of resources and rights within contracts. Smart contracts provide far more regarding performance of contractual obligations than traditional contracts. Any new costs of software validation and verification will be additional to those in traditional contracts but need to be considered in the context of costs of performing contractual obligations (which will clearly vary based on the context). For example, given smart contracts effectively provide more of a self-help ability to ensure performance, the true cost needs to be compared to traditional contracts factoring in a probability of needing to litigate in some scenarios and the associated costs to such steps.

Traditional contracting acknowledges that it is impossible to arrange for every possibility, allowing for courts to adjudicate issues ex post, when the facts are known. This ex-post characteristic is fundamentally at odds with the automaticity of performance of smart contracts. Accordingly smart contracts whilst linking to systems and data in relation to performance of contractual obligations, also potentially shift the costs of contracting to the pre-contracting stage (as everything has to be drafted in the contract).

The correct balance point of pros and cons is addressed through the increasing use of model clauses (the availability of which reduces the costs of smart contracting), that allow for breaks in performance and modification via third party oracles, noting that this best accommodated in the context of private blockchains. One is addressing the inherent tensions considering automation and immutability – noting that the main benefit of smart contracts are massively eroded if we automate the performance of contractual obligations – but incorrectly. Reduced automation is likely better than incorrect automation.

False benefits: we see the ability to fully decentralise and not need any trusted central authority or governing entity as a false benefit – and in fact, as smart contracts increase in complexity, a significant disadvantage. If code infallibly executes the transaction – the ability to trust the code implies the need to trust the code developers. The trustworthiness of a distributed ledger therefore depends on the trustworthiness of the code developers, replacing traditional intermediaries such as lawyers and/or banks. It is no surprise that these are both highly regulated given their positions of trust. An equivalent will necessarily also emerge in respect of smart contract developers.
Process of developing smart contracts

Question 6.

What process do the parties follow (or plan to follow) in negotiating, drafting and entering into a smart contract? Please explain in particular:

(1) where all the contractual obligations are contained in a natural language agreement and the code is intended merely to perform those obligations, the practical steps involved in coding the parties’ rights and obligations contained in the natural language agreement;

(2) where the parties intend that there will be a hybrid contract or a solely code contract, the practical steps involved in drafting, negotiating and agreeing the code of the smart contract;

(3) where there is a hybrid contract, whether the natural language element and the coded element are entered into contemporaneously or at different times; and

(4) the role played by third party service providers (such as computer coders and software firms) in this process.

We note that this is a fast-evolving area in terms of practice.

As with software development outside of smart contracts, it would be usual to have a business requirements document which sets out (in traditional natural language and in non-technical terms) what the system is meant to achieve for it to be "a success" or "meet the requirements of the business" (in the context of a smart contract, the "business" would be the person/entity entering into the contract).

An example of a business requirement might be: "the car is easy to park". This business requirements document is then typically handed to a technology team, who create a "Functional Specification Document". This would detail how the system is designed to meet the business requirement. Using the example provided, the car might be made less than a certain length, or it might have a parking camera added to it, or "auto park functionality". It would be normal to expect the business to read and sign off on the approach proposed by the technology team (which might be outsourced to a third party) to meet the stated business requirement. It should be noted that for cases where the performance automated by systems is in a critical area where unexpected outcomes (due to bugs in code) can have significant consequences, it is common to utilise (typically third party) code verifiers\(^\text{11}\) / auditors. We understand this is common for higher value ICOs. Our view is that good software/smart contract development practice would utilise a similar approach for the development of a smart contract.

For programmers, immutability presents a special challenge – whereby coding errors (bugs) cannot be altered, although as we detail in our response elsewhere, this can be less of an issue in the private distributed ledger context, although best practice is developing in this area through clauses that allow annulment, termination or modification through various mechanisms. The need for detailed business requirement and functional specification

\(^{11}\) Note that code verification can be completed to some extent using “formal verification” which is the act of proving or disproving the correctness of intended algorithms that form the basis of a system with respect to a formal specification. This is done using formal methods of mathematics. See work by Shao and Gu regarding a formal verification protocol (CertiKOS) for blockchain. These formal methods can struggle to scale for complex contracts / specifications.
documentation is therefore heightened, however, we believe this will develop as the complexity and importance of the smart contracts increases.

The typical steps set out to “making an offer” are set out as a user typing out the code of a smart contract after, if to already completed, downloading and synchronising with the relevant distributed ledger e.g. Ethereum, and becoming part of the network. The user “proposes” a specific contract by making it available in the system, with the contract having its own identification number and then functions as an autonomous entity within the system. We note that this is appropriate for very simple smart contracts (as is mainly the case today), but not so for more complex contracts, that need considerably more thought and development than this process would suggest. The idea that one party types up / codes the contract, with less involvement from the counterparty in this step is more relevant for business to consumer contracts, where the business entity will type up the code and make the contract available on the system to consumers.

As complexity of the contractual subject matter increases, as well as the negotiation between parties regarding the commercial position and means of automation of performance, the smart code development is more likely to become more of a joint effort – at least in terms of agreeing business requirements and functional specifications. One party will either be responsible for then uploading the code onto the distributed ledger, or a mechanism will become more established for this to be done jointly, or delegated to an appointed third party.

In this context, the code embedding the contract terms may not produce results as intended by the parties. The divergence between a smart contract as intended and expectations of outcome is likely to result in the emergence of torts “for negligent coding or updating”\(^\text{12}\)

We add for context and emphasis, our string view that most smart contracts do not receive the required level of design, testing and general scrutiny that would be appropriate for them as they increase in complexity and impact in terms of performance. This should be contrasted with software used in banking and finance transactions which are generally tested for long periods (sometimes years!) before deployment, and by multiple groups. The fact that public distributed ledgers such as Ethereum allow anyone to create smart contracts and then upload them onto live production systems seems attractive from an openness perspective (exemplifying a spirit of democratised access and equality) but it is not sufficient or adequate to support the true future of smart contracts and their benefits.

We see best practice emerging to utilise legal code audits could be implemented analogous to the security audits widely used by firms engaged in software development. This approach represents of a sort of legal engineering of smart contracts.

**Question 41.**

Can you provide examples of terms that parties have included (or might include) in the natural language element of the smart contract to address the risk that subsequent events might affect the performance of the code?

Please explain:

(1) the drafting of the provision;

(2) the subsequent events covered by the provision;

\(^{12}\) M Raskin “The Law and Legality of Smart Contracts (2017) 1 GLTR (Georgetown Law Technology Review 05, at 328.
(3) the effect, under the provision, of the subsequent event on the contract; and,

(4) the remedies available to the parties under the provision.

Consistent with our earlier comments as well as some further discussion below, we have seen the increased actual and investigated use of oracles or multig functionality in order to achieve – in which case, there is a natural language contract allocating responsibilities and duties to, for example, the third party performing the role as the trusted 3rd party oracle.
Process – Use

A user proposes specific smart contracts by making it available on the ledger. The contract has an identification number (id) and functions as an autonomous entity within the system. Other users may then “accept” the contract by communicating to it on the distributed ledger, for example by making a payment or transferring title to an asset.

Question 9.

In what ways can parties reach an agreement through their interactions on a distributed ledger?

Question 10.

Are you aware of programming languages which are specifically designed to enable parties to reach agreement on a distributed ledger?

If possible, please give examples of the circumstances in which they could be or have been used.

Question 12.

How common is it for parties to enter into smart contracts on a DLT system without knowing each other’s real identities and in what circumstances is this likely to arise?

This is currently common, however as the important of smart contracts increase, and as well as what is at stake and need for potential legal recourse increases – this will become less likely (and also drive the use of private and permissioned distributed ledgers).

Question 33.

What steps or precautions (if any) do parties typically take before entering into a smart contract to satisfy themselves that the code will execute as intended?

Please see our comments above in respect of software development through business requirements, functional specifications, testing and also verification/audit steps.
Execution

Question 19.
Do you consider that parties can “sign” an agreement recorded solely in code?

If so:

(1) are you aware of technologies that are currently in use or under
development to facilitate the signing of agreements recorded solely in code?

(2) please provide any examples from your experience of where the parties
have signed an agreement recorded solely in code.

Question 20.
Do you think that smart contracts using DLT are currently able to utilise eIDAS
compliant advanced electronic signatures and qualified electronic signatures? If not,
how do you think they could be designed to accommodate these types of
signatures?

Question 21.
Are you aware of any cases in which parties have arranged for the terms of a deed to
be performed by, or recorded in, computer code deployed on a distributed ledger?

Question 22.
Do you consider that a deed recorded partly or wholly in code can satisfy the
statutory formality requirements applicable to deeds and address the implications of
the Mercury decision?
Legal contractual analysis

We initially draw parallels to electronic signatures where existing rules of contract law were ultimately easily applicable. Core changes related to contract formalities were amended to recognise electronic records as needed (for example as being equivalent to written instruments and attribution replaced the need for physical signatures in countries with “in writing” or statute of fraud requirements). We think it is again helpful to re-emphasise that smart contracts simply link contractual obligations to (and create agreement in respect to the running of) system-based performance mechanisms.

We note the past adaptability of English contract law to new modes of communications such as letter, telex and instantaneous communications such as emails – and suggest that statements such as that of the LTDP will help to extend this to smart contracts. We note judicial support through cases such as R (Software Solutions Partners Ltd) v HM Customs & Excise, where it was held that an “automatic medium for contract formation” can result in valid contracts.

**Question 11.**

Do you consider that offer and acceptance can occur through the operation of autonomous computer programs deployed by the parties on a distributed ledger? If so:

(1) in what circumstances?

(2) on what legal basis?

We do not believe there should be any reason why offer and acceptance cannot be analysed in the usual way as we believe that smart contracts can in theory meet all of the requirements set under English contract laws to be considered as contracts in the legal meaning of the term.

The fact that parties submit their cryptographic private keys to commit resources to a distributed ledger technology based contract provides proof of commitment. On platforms such as Ethereum one party must post its (on-chain) smart contract on the blockchain, and it is then accepted by the cryptographic key of the other party. The posting of the on-chain smart contract on the blockchain acts as an offer.

Some have argued that the smart contracting process is not different from an advertisement, and therefore only an invitation to treat. However, as the offeror posts his contract on a distributed ledger in assembly code that specifies the precise terms of the performance steps of a contract, it will most likely be held exact enough to constitute an offer and not only an invitation to treat (and certainly, more so than a traditional contract equivalent).

Once a proposed smart contract is posted on a distributed ledger and fulfils the “offer” requirements it is capable of acceptance by the offeree. This acceptance can be by performance, for example by transferring control of a digital asset to the smart contract (including a digital representation of an offline asset). The action of uploading assets to the smart contract should provide an unequivocal communication of acceptance.

Although the performance of a smart contract is automated, it still requires the contracting parties to exercise their will in order for it to become effective. Such intention is manifested at the moment when a party decides to enter into such an arrangement on the terms specified by the offeror in advance (noting that, as we detail above, as smart contracts increase in complexity, we expect the development to become more of a joint effort in
valuable commercial transactions through the use of business requirements and functional specification documentation that are agreed prior to writing of high-level programming code).

The contracting parties to a smart contract are at a technical level, not individuals but cryptographica private keys which in most current circumstances will represent individual persons. As for autonomous smart contracts, the facts will typically present themselves as that private keys do not act by themselves, rather they are instructed by humans.

We do however acknowledge that this distinction is likely to blur over time, through increasing sophistication of a AI-based algorithms. This is likely to become an issue for smart contracts. We note, however, that this is a much wider topic regarding autonomous systems as legal agents and suggest that the narrow question regarding whether offer and acceptance can occur through the operation of autonomous computer programs is dependent and ought to be influenced by many far-reaching questions in respect of such a wider topic (such as the question of liability).

We note that there is precedent for offer and acceptance occurring by operation rather than a bilateral exchange with clear knowledge of identities of all parties. There has been extensive analysis done in this regard with respect to the laws of England and Wales (and other jurisdictions) in respect of the ISDA protocol\(^{13}\), which has been utilised in the case of significant market or regulatory events in the banking and finance industry, such as the introduction of the Euro and cessation of LIBOR. We do however draw a distinct difference between the use of the term “protocol” in this regard and that in which it is referred to at footnote 147 of the Call.

**Question 13.**

What evidence might be available to a court to establish the identity of the parties to a smart contract entered into pseudonymously on a DLT system?

As detailed in the Call for Evidence, it may not be possible to uncover the identity of parties to a smart contract entered under a pseudonym on a DLT system. We envisage sophisticated parties to be aware of these issues and therefore ensure validation of identities of counterparties to a smart contract as part of their due diligence on public distributed ledgers.

We believe it is important to provide protection for the vulnerable / less sophisticated parties that may not realise the implications of public (rather than private) distributed ledgers and consequential the impact of not being able to establish identity of a party one faces on a smart contract (or other related party) as this area matures.

We believe that the anonymity of a public distributed ledger does not validly assist the smart contracts use case. We note the likely building of feedback systems on top distributed ledgers, to attempt to provide reliable reputation ratings, attaching more weight to the feedback of an established and trusted users on the network than new identities. This is the way business works (including in the consumer context re: insurers when seeking to take out cover). It is in the parties’ self-interest to build a reputation of reliability, honesty and fair dealing. This is the reason why identity is so crucial, else one can simply erase one’s history by utilising/creating a new pseudonym.

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\(^{13}\) The Satanita [1897] AC 59

We note also the need for solicitors to “know their client” when acting for example, in drafting traditional contracts. Such considerations for coders in the smart contracting context will ultimately further add to the need for disclosure of identities.

Regarding capacity: Public distributed ledgers do not check for legal capacity and in principle, anyone can open an account even if they would be regarded at law to not have sufficient legal capacity to do so. We regard capacity as an even more vital check given the immutability of the distributed ledger environment, and therefore see an increasing practice of, in respect of higher value transactions, obtaining legal opinions on such matters, as well as coverage of other enforceability concerns. This might be tied into entry criteria in respect of permissioned distributed ledgers. The legal opinions might also deal with issues such as the enforceability of any reverse transaction mechanisms or enforceability of multisig functionality (or capacity of that additional signatory).

**Question 14.**

Are you aware of, or do you foresee, any difficulties in applying the law on consideration to smart contracts? If possible, please provide examples.

We don't believe there should be particular difficulties - the format of the agreement does not necessarily impact on the analysis as to whether consideration has been given (either within the terms of the agreement or outside of it).

**Question 15.**

Are you aware of, or do you foresee, any difficulties in determining whether the parties to a smart contract have reached a certain and complete agreement? If possible, please provide examples.

We believe that this may, in fact, be easier with smart contracts given the codification of terms. The very process of codification of the agreement is likely to provide ample evidence of this in most cases.

**Question 16.**

Are you aware of any instances where the parties to a smart contract have expressly agreed that they do not intend to create legal relations?

To the extent this occurs, we believe this is the result of a lack of understanding of smart contracting. Parties may often not realise that having an embedded dispute process does not mean that they do not intend to create legal relations (as they would typically expect some rights/legal recourse if that embedded process was not followed).

The position of typical parties' intentions is better phrased by suggesting that they try and avoid the need to go to court to ensure performance. This is not the same as wishing that their contacts cannot end up in court to be upheld. In the conclusion of a smart contract, if an offer has been accepted, then one could say that its performance has also commenced, based on which it is very unlikely that a reasonable party would not see this as binding and an enforceable agreement.

As a precaution, a party who wants to ensure that there is an intention to create legal relations could do so by wrapping the code up in a contract, a part contract that acknowledges the smart contract is a valid legal agreement.
We believe that over time, understanding will develop and that parties will specifically intend to create legal relations and it would be rare for the parties to want otherwise (perhaps in the context of activities that would be discouraged as a matter of public policy or say illegality!).

Mature smart contracting parties are not seeking to replace contract law, rather reduce the need for contract litigation to ensure performance by the other side. The recourse to legal mechanisms may, however, be limited if dispute resolution mechanisms are embedded in the underlying code, as these would likely need to be exhausted as an initial first step.

One of the dreams of smart contracts are that they provide a self-help (automated) remedy in terms of performance. It may be the very attraction to a particular smart contract use case (e.g. ensuring an insurance payout on particular where the insured is concerned of fair payout). Traditional contracting and contract law, which focuses on judicial actions mean that self-help remedies are naturally underutilised. We could see a future where court orders are given effect by linking these to automated performance of those court orders.

**Question 17.**

**Do you foresee any difficulties in ascertaining whether parties intend to create legal relations when they transact with one another on a distributed ledger?**

In commercial relationships, the intention to create legal relationships is presumed in common law and will need to be disproved by the party alleging that there is no such intention. Hence for smart contracts entered into in a business setting the intention to create legal relations will be presumed, regardless of whether a business to business or a business to consumer setting.

However, if the computer logic has already been encoded and both parties have transparency as to what the coded rules that have been put in place – at that point, there is likely to be little doubt regarding the intention to create legal relations. Diligence and verification of smart contract code would add to the presumption.

There are likely to be more issues in respect of “follow-on” contracts that are brought about by the performance of an earlier contract, however we again believe that the facts and context would make this clear.

**Question 18.**

**Do you consider that source code could meet the definition of “writing” in the Interpretation Act 1978?**

The analysis will likely differ depending on how much of the arrangement is represented by code and how much is in a more traditional natural language format. Compliance with specific registration requirements of different public registries (e.g. registration of security at Companies House, Land Registry requirements) will also be relevant.

We note the distinction between higher order programming languages and assembly code. The lower level the smart contract code, the more difficult it would be to meet this definition of ‘in writing’.

**Question 23.**

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Are you aware of, or do you foresee, any difficulties in applying the principles of interpretation to identify whether terms of a particular smart contract are contained in the natural language component or the coded component of the smart contract, or both?

We expect this to be clear based on the circumstances. It would be helpful, in cases where there are interpretation issues between the two, to have an order of precedence set by the parties.

**Question 24.**

In what circumstances might disputes arise about the proper interpretation of the coded terms of a smart contract? Please provide examples where possible.

We believe the use of clause libraries and model clauses in smart contracting will mean that they need to be viewed as standard form contracts. Issues regarding relevance of market practice and learning from the interpretation of standard contracts will need to be considered. General legal principles about contract interpretation may need to be adapted when standard coding is relied upon by multiple parties in “a multiplicity of transactions in a plethora of circumstances”. In such cases, the aim should be for clarity, certainty and predictability for a large number of parties. We envisage that smart contract coding is likely to be less context specific, and particular party facts have possibly a more limited role. Given the nascent stage of development of smart contracts, one needs to ensure flexibility that can accommodate a range of users and to avoid a construction that is too narrow, and mitigate the risk of protracted, expensive litigation where the performance and contractual terms of the smart contract itself doesn’t provide a resolution to disputes.

We note the important role oracles may play, where set as the way in which disputes are managed and resolved as envisaged within the smart contract code itself (through an off-chain input). In this circumstance, the oracles would have a role akin to rollers built into a bridge that allow the bridge to contract or expand, rather than collapse, when there is an unexpectedly high wind or extreme change in temperature.

**Question 25.**

Do you consider that the meaning of a coded term of a smart contract would or should be determined by asking what the term would mean to a :

1. reasonable person;
2. reasonable person with knowledge of the relevant code; or
3. functioning computer?

We believe the fundamental principle is to construe the true intention of the parties when entering into the arrangement. Therefore, we suspect that the reasonableness test may become more complicated, as the parties’ actual level of knowledge in relation to understanding code will need to be taken into account. Parties are likely to have a wide range of knowledge and understanding of code and coded terms, and it is therefore likely to be very difficult to formulate a blanket test. Indeed, it may well hold back adoption if parties are assumed to have a level of knowledge that they do not have.

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It should not be determined with respect to what a term would mean to a functioning
computer. This may be far from the intention of the parties, and the term “functioning
computer” would also bring significant ambiguity to matters, as there are likely to be many
“functioning computers” that may reach different states based on the same code based on
their configuration and set-up.

Considering which of the first two options would be more appropriate, this question highlights
the inherent tension between an objective approach to interpreting contracts and taking into
account parties’ intentions. We believe the answer needs to be determined by the specific
context that may arise. Where the parties have resources and expertise, it should be
determined with regard to a reasonable person with knowledge of the relevant code, as the
parties are more likely to be in a position to have or bring in the necessary expertise (such
as a code verifier). It would be more likely to be determined with respect to a reasonable
person in the case of consumer contracts.

Question 26.

Do you consider that performance of the coded terms of a smart contract cannot
always be predicted based on a reading of the code?

If so, can you provide examples or specific evidence of this occurring?

We agree that performance cannot always be predicted based on a reading of the code, but
we are not clear that this is any different from natural language contracts. Drafting styles of
code will evolve in order to ensure greater readability and also a better ability to predict the
outcomes of the smart contract code in different scenarios. We believe items such as code
comments and smart contract design (ideally using modules and code classes) will assist
with this.

Software development typically also relies on testing, in order to ensure understanding of
functionality matches to that of business requirements and functional specifications. The
results of such testing would be required for more complex contracts, to help parties predict
the performance of the coded terms. As smart contracts increase in complexity and
importance, we believe that this will become increasing market best practice.

We note that natural language contracts are sometimes drafted to provide flexibility for
dealing with unexpected events (this would be the main source of unpredicted behaviour
assuming parties adopt a mature software development process), and we see a need for the
same in respect of smart contracts. This might be through the use of oracles, where the
data input from the oracle is not automated or system-based (although this would require
trust in a third-party (controlled) oracle).

Question 27.

What practical or procedural steps could the courts take to resolve disputes about the
interpretation of the coded terms of a smart contract?

We believe there is a need to educate judges and also that there is a role for specialised
courts and tribunals as smart contracting increases. There may be a special case here for
combining lay and legal expertise (cf. Lord Mansfield’s 18th century example of “dining with
leading merchants and traders to ensure that he kept up to date with the latest
developments in the markets. And he drew on expert witnesses and assessors in, for
instance, maritime shipping matters to assist the court in deciding commercial questions” –
the usage of merchants.)

We also see a role for a collated group of experts being created in this area, akin to
P.R.I.M.E. Finance, in respect of complex financial disputes.

Question 28.

Are parties utilising natural language in smart contracts to make their intentions clear
in respect of any coded terms or the contract as a whole?

Parties often utilise and rely on comments in the code (these are typically inserted prior to
code sections / particular routines / functions and classes to aid readability of code). Please
see our responses above.

Question 29.

In what (if any) circumstances should courts be able to consider evidence of the
parties' pre-contractual negotiations as an aid to interpretation of the coded terms of
a smart contract?

Question 30.

Do you consider that the courts’ current approach to contractual interpretation might
cause problems in the context of smart contracts? If so: (1) Can you provide
examples or specific evidence of this occurring? (2) What could be done to solve
these problems?

Please note our thoughts earlier regarding the greater importance and relevance of market
practice and learning from the interpretation of standard contracts. Pre-contractual
('legislative') history and group negotiation are likely have greater relevance than ought to be
the case with bilateral, one-off contracts, especially if smart contract development utilises
model clauses as we expect.

Accordingly, any expressions of intent of standard-setters and commercial purpose and user
guides (e.g. in respect of clause libraries) will be very important.

We see merit in an approach that looks for issues giving rise to principles; where a statutory
interpretation-like approach would help benefit a wide body of other contracting parties that
are subject to the same coded language or using the same software.

Perhaps where the parties' pre-contractual negotiations provide, not so much an intent as to
the meaning of a term, but rather the more limited instruction that the parties intended that
any such answer should be grounded in market expectation and practice, such as should
send the court to the pre-contractual expectations of the standard-setter or working parties
that first generated the code or sought to inform the software.

Question 31.

Are you aware of, or do you foresee, any practical difficulties in ordering rectification
of the coded terms of a smart contract? If so, do you think that parties to a smart
contract will, in practice, seek rectification?

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17 https://primefinancedisputes.org/page/what-we-do
Question 34.

Do you consider that the legal principles concerning unilateral mistake might need to be adapted to accommodate smart contracts concluded by computer programs without human intervention?

In particular:

(1) is it appropriate to confine a unilateral mistake to a mistake about a term of the contract?

(2) what test should the court apply in determining whether the non-mistaken party had knowledge of the mistaken party’s mistake?

Question 35.

Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether a smart contract has been entered into as a result of a misrepresentation?

Question 39.

Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning breach of contract to contracts recorded wholly or partly in computer code?

Question 36.

Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning rescission to smart contracts which have been vitiated for misrepresentation, duress or undue influence?

Question 37.

Are you aware of, or do you foresee, any difficulties in awarding damages for breach of contract where the terms of a natural language contract are performed automatically by computer code?

Question 38.

Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning termination where the terms of a natural language contract are performed automatically by computer code?

Question 40.

Are you aware of, or do you foresee, any difficulties in applying the law on frustration to smart contracts?

Question 42.

Are you aware of, or do you foresee, any difficulties in applying the illegality doctrine to claims made in relation to smart contracts?

In respect of questions 31-42 above, we restate out view that such difficulties in applying such laws and doctrines will ultimately be resolved through the use of private distributed ledgers and model clauses to allow application of such laws and doctrines through the use of oracles.
Question 45.

What challenges do you foresee in applying consumer protection laws to consumer contracts entered into wholly or partly in code?

Are there any additional existing protections, beyond those we have discussed, which you think are or will be particularly important in the smart contract context?

We note the importance of laws such as Article 5 of the Unfair Terms Directive, which requires that pre-formulated terms “must always be drafted in plain, intelligible language”. At a minimum, the Unfair Terms Directive we believe would oblige businesses to provide consumers with plain, intelligible summaries of smart contract code designs. Only through such presentation of terms can they become a valid part of the smart contract and give smart contracting for business to consumer transactions a future.
Remedies

We start from a view that smart contracts are not truly enforceable without contract law and that it is ultimately down to the courts to determine whether performance should stand.

Contract law, like it has with the principle of anticipatory repudiation or breach to proactively anticipate breach, might on the face of it, need to develop rules to retroactively deal with technically conforming performance, despite features of distributed ledgers that make the application of contract law’s policing doctrines such as duress, mistake and, misrepresentation trickier than they might be in the non-distributed ledger context.

However, we think that the practical use of smart contracts on permissioned and non-public distributed ledgers alleviates much of the need for such need for rules to retroactively deal with technically conforming performance of code.

We see model clauses arising to provide authority to reverse transactions, or simply a break glass mechanism. The code itself can be set such that the logic flow seeks external input from oracles at appropriate timepoints and predefined events. The external event can occur from a human-controlled IT process into to which the smart contracts are embedded or from authorities or courts. We note that it would require every party in every contract to agree to insert such a clause (or the party posting the contract could certify it has). We expect best practices to emerge here as smart contracts become more complex and with more at stake commercially along this evolutionary journey.

We note the possible use of multisig technology, where a system contract performance requires two out of three keys – one is in possession of each party and the third is in the possession of a mutually trusted third party (such as an arbitrator). If two parties agree on performance, they both sign using their keys (this might be automated and a party instead, has an ability to indicate disagreement) and the relevance contract (performance) step takes place. If there is disagreement, the trusted third party can choose to sign the contract and thus involve itself in the contract performance, or to withhold its signature, thus preventing the contract from being executed (the idea being that complex performance is through smaller smart contracts, creating a modular approach to smart contract design to manage complexity).

Arbitration offers parties the potential to agree bespoke procedures that may help overcome the challenges presented by pseudonymity and the irrevocable nature of smart contracts. For example, the parties may agree to refer disputes below a certain threshold to a central distributed ledger administrator with the power to determine disputes and insert remedial transactions into the distributed ledger as necessary.

The above in effect allows alternative dispute resolution/online dispute resolution within a smart contract. Although this to some extent defeats automatic execution, there would likely be checks and balances to limit usage and occurrence to prevent a party seeking to cause trouble by simply disputing (or possibly blaming the oracle, hence the identity and trustworthiness is critical of such an oracle), for example setting a cost to challenge.

We note that in the context of private and permissioned distributed ledgers, the reputation of the parties and oracles would also be helpful in this regard, and encourages proper and suitable behaviour, especially where this is emphasised through review systems to the relevant community. There might also be sanctions set operating at the level of a distributed ledger community and/or industry.
Question 32.

Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether the parties have made a common mistake when entering into a smart contract?

Smart contract code development is very cumbersome and error prone due to features of distribute ledgers and also concerns regarding a distributed ledger’s potential (noting such concerns are diminished in respect of private blockchains) immutability resulting in an inability to fix errors after publishing a smart contract. Common errors that lead to unexpected results include failure to account for unexpected states, failure to use cryptography and overflowing the virtual machine stack. We believe that the determination of “mistake” in such cases will be relatively clear to a developer or a court guided by an expert.

Question 46.

What, if any, additional protections do you think are required for consumers entering into smart contracts? In particular, do you consider that there is a case for an explicit legal requirement that terms of a consumer contract which are fully or partly in code must be explained in natural language before the conclusion of the contract?

Yes, we believe such a legal requirement would be a sensible measure.

For automated data processing, risk disclosure, in particular, will be an important element, especially given the possible inability to halt this once the automated performance is underway.

If personal data\textsuperscript{18} is processed in any manner, then data protection rules must also be considered.\textsuperscript{19} To the extent that data protection law is relevant, it will be necessary to ensure that its compliance obligations regarding transparency for data subjects are adhered to at the correct stage in the process, and that consumers are able to effectively exercise their rights. Finally, any restatement of consumer fairness and transparency principles in the context of smart contracts would also need to take account of data protection principles.

\textsuperscript{18} ‘Personal data’ is defined by the General Data Protection Regulation (GDPR) as ‘any information relating to an identified or identifiable natural person (‘data subject’); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person.’

\textsuperscript{19} Article 22 of the GDPR states that solely automated data processing can be used where it is necessary for a contract between a data subject and controller or is based on the consent of a data subject. Further, Article 22(3) requires controllers in such cases to implement safeguards including a right to human intervention to ‘safeguard the data subject’s rights and freedoms and legitimate interests.’
Jurisdiction

We believe that in such new ‘territory’, jurisdiction ought to become less important and should take a back seat to resolution based on equitable principles (and perhaps more as a matter of almost customary international law). Perhaps international arbitration a better answer as it resolves enforcement of judgement issues for disputes arising from technological activity less ‘on the ground in any particular place’ when compared with much commerce as we have known it. It may offer a better alternative when it comes to competence, lay expertise and multi-linguistic receptivity.

As noted in the Call for Evidence, we believe that there are problems determining the governing law and jurisdiction on smart contracts. There are challenges in determining key elements including the location where the contract is formed, the property is situated, the place where the harm occurs and the loss is crystallised. In its report, the LTDP in its report acknowledged that “these complex issues will best be resolved by legislation, most likely following international cooperation” and tentatively suggested a number of factors that may be relevant. These include: (a) whether any relevant off-chain asset is located in England and Wales; (b) whether there is any centralised control in England and Wales; (c) whether a particular relevant asset is controlled by a particular participant in England and Wales (because, for example, a private key is stored there); and, (d) whether English law is applicable to the relevant transfer (perhaps by reason of the parties’ choice), might be particularly relevant in determining whether English and Welsh law governs.

Where the parties do not specify the governing law in the smart contract, and the claimants in a dispute are asking the court to rule in a matter which has a foreign element, we may see the courts looking at how best to apply the conflict of law rules to the particular factual situation. This is seen most recently in the in Ion Science Limited & Duncan Johns v Persons Unknown & ors case before the Commercial Court. The case concerned an allegation of fraud in an initial coin offering (ICO). The claimants sought interim relief: a proprietary injunction and worldwide freezing order over the assets of the individuals connected to “Neo Capital”. The significance of this first-instance that in reaching its decision, the court indicated that the applicable law (based on venue/location) of a crypto-asset is the place where its owner is domiciled. This was the first time a court looked at the applicable law (based on venue/location) of Bitcoin, and the judge drew on the reasoning of Professor Andrew Dickinson20 (which is also referred to in this Call for Evidence). This case highlights how consideration of all the facts will be relevant, including factors such as (a) where the transactions take place; (b) where assets and currency are purchased and delivered; (c) where the harm takes place; and (d) where the smart contract account is located.

We have identified certainty as one benefit of smart contracts. In the absence of any legislation on this and binding case law, we believe some sort of model clause that helps parties to set appropriate governing law and jurisdiction would be helpful. There is also scope in this area for dispute resolution mechanism (such as arbitration) again to be specified in the contract as detailed above.

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20 ‘Cryptocurrencies and the Conflict of Laws’ in Cryptocurrencies in Public and Private Law, eds. David Fox and Sarah Green, Oxford, 2019
Question 47.

Are you aware of, or do you foresee, any difficulties in identifying the place of formation of a smart contract?

Given, as has been acknowledged, that a contract can be made in two or more places at once, the nature of smart contract transactions and the number of actors involved, it will be difficult to pinpoint one formation point for contracts.

Question 48.

In what circumstances do you think that jurisdiction to hear a dispute in relation to a smart contract could be based on the actions and location of an agent?

Question 49.

Do you think that a rejection of state law in favour of the rules contained in the platform’s protocol is or should be a choice that can be given effect to under article 3(1) of the Rome I Regulation?

We believe this is an interesting proposal. Smart contracts are developing and it is to be anticipated that those entering into these are doing on the basis of the platform’s protocols. The traditional legal recourse will however be needed, should the platform’s protocols not be given effect to (for whatever reason), or other issues such as misrepresentation.

Question 50.

Can an express choice of applicable law be embodied in computer code? If possible, please provide any practical examples of a coded clause expressing a choice of applicable law.

Yes. This could simply be done through the setting of a variable (e.g. vGoverningLaw), to an appropriate value to ensure a common understanding.

This could be further at the more detailed level of setting a judge and court as an oracle-based input, which moves the jurisdiction to the real world and lessens the claim of a self-contained digital environment outside of the law.

Question 51.

What factors are capable of connecting a smart contract to a particular jurisdiction, for the purposes of article 4(3) and 4(4) of the Rome I Regulation?

Question 52.

Are you aware of, or do you foresee, any difficulties in the context of smart contracts in applying the choice of law rules that apply under the Rome I Regulation to contracts of carriage (article 5), consumer contracts (article 6), insurance contracts (article 7) and individual employment contracts (article 8)?
**Question 53.**

Do you think that a rule of jurisdiction based on the place of contractual performance can be applied where the performance takes place on a distributed ledger?

As technology and transactions develop, there will potentially be an increasing number of actors located in various jurisdictions. If the location of actors was considered a potential connecting factor for jurisdiction, this could be a disincentive to the use of smart contracts as there would be uncertainty over which courts had jurisdiction. This can lead to delays and costs in resolving disputes, and a potential increase in satellite litigation.

Given the likely use cases in a smart contract and distributed ledger context, we note that this rule may not be appropriate or possible in many cases. We would therefore caution against any blanket approach as suggested by the question.

**Question 54.**

What factors do you think are capable of connecting a claim in relation to a smart contract to a particular jurisdiction?

**Question 55.**

Which, if any, rules for establishing jurisdiction do you consider will be most problematic in the smart contracts context? Do you agree with our analysis of the issues as described in this call for evidence?

We agree with the analysis. Given the inherent difficulties we would suggest that, outside of the consumer context, the jurisdiction selected by the parties should be given effect, and parties should be encouraged to agree its relevant jurisdiction before entering into/as part of a smart contract).
**Other**

**Question 56.**

*Are there any issues we should be considering on smart contracts beyond those we discuss and ask about in this call for evidence?*

We think that smart contracts have particular relevance in respect of the financial services industry and strongly interrelate to FinTech. The relevance of this sector would ideally be noted and involved in next steps to shaping best practices.

We ask for greater consideration of the way in which parties address the risk of inaccurate and/or poor quality data of inputs into a smart contract (e.g. via an Oracle) and unexpected outcomes that might have on the automated performance. The automated performance is typically triggered by the occurrence of a set of defined events. One establishes whether those events have occurred through data (for example, from an oracle). If there is inaccurate or poor quality data at hand, it is likely that the automated performance will depart from the intention of the parties.

We envisage practice emerging to have a contractual relationship with the oracle setting out the various responsibilities and liability of the oracle.

The world is increasingly data driven, and it is hard for the law to “remain analog and disconnected from systems and data, in an increasingly digital world”. Oracles and the data they provide are likely to be the bridge between the two. We note increasing research an proof of concepts into areas such as “smart legal opinions”, where a digital representation of legal advice might seek to interact with smart contracts in order to dynamically impact performance\(^{21}\).

**Question 57.**

*Which other jurisdictions should we look to for their approach to smart contracts, and why?*

**Question 58.**

*Are there any legal reforms that you consider immediately necessary to remove uncertainty and unlock some of the potential benefits and cost savings of smart contracts?*

No, we consider the current state of English law to be more than sufficient to accommodate even a wider definition of “smart contracts” that envisaged by this Call for Evidence. Rather we believe there to be a need to help enhance best practices regarding smart contracts themselves e.g. the use of model clauses to deal with issues such as mistake and/or frustration.

**Other Observations / Comments**

In terms of the description of DLTs set out in the Call, we believe it is misleading to say that when data is added to the ledger, every node’s copy of the ledger is updated instantaneously. This is only true from the perspective of block numbers. Nodes are not synchronised amongst themselves – they execute independently and collaborate in growing a chain of numbered blocks. Therefore, at any point in time, the ledger stored by every node

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\(^{21}\) Smart Close-out Netting, Professor Christopher Clack (UCL) and Akber Datoo (D2LT), available at: https://arxiv.org/abs/2011.07379
will not necessarily be exactly the same. This is why there might be multiple chains in existence, which is resolved by accepting the longest chain as the valid version of the blockchain. This is one of the reasons why coding in languages for distributed ledger technology can often be harder than in non-distributed contexts.
SUBMISSION

Law Commission Smart contracts - Call for evidence
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ABOUT THIS SUBMISSION

The Digital Law Association is an organisation dedicated to the promotion of a fairer, more inclusive, and democratic voice at the intersection of technology, law and policy.

Our mission is to encourage leadership, innovation, and diversity in the areas of technology and law by:

- bringing together the brightest legal minds in the profession and in academia to collaborate; and
- developing a network that promotes digital law, and particularly female leaders in digital law.

Submission Process

In developing this submission, our members have engaged through email correspondence and virtual discussions relating to the questions posed by the Law Commission smart contract Call for evidence. This is to ensure everyone has had the opportunity to provide input on these issues.
EXECUTIVE SUMMARY

The Digital Law Association is pleased to provide this submission to the Law Commission’s Call for Evidence in relation to Smart Contracts. The Digital Law Association is an organisation dedicated to advancing a fairer, more inclusive and democratic voice at the intersection of technology, law and policy (https://digitallawassociation.com). With global membership in the thousands (when including our cross-platform social media following), we identify the need for clear and appropriate guidance for the legal and technology sectors in relation to the understanding, use, requirements and enforceability of smart contracts.

Smart contracts have evolved from a technology-led push to automate transactions, and in many cases to avoid intermediaries. We see this as part of the broader movement towards digitising contracts, with integration of active coded components that allow for automation and ‘self-performance’ at the more complex end of that digitisation spectrum. By integrating legal language and agreements of legal status into and alongside the code of a smart contract we can form legally binding contracts (or, smart legal contracts). It is important that the digital evolution of these new digital, but also legally binding contracts (with their consequential wide-scale impact on the practice of law and the broader economy) is not shaped solely by technological and commercial drivers (for which legal precedent and certainty must wait for legal judgments), but is shaped by well-established legal principles, duties, legal oversight and an eye to the rule of law as well as technology governance standards grounded in ethics.

Enhancing legally enforceable contracts at scale through automation, structured data, and digital connectivity will unlock significant value for the economy. Smart contracts have the capacity to enhance both efficiency and transparency in the rapidly emerging realm of the digital economy notwithstanding the existing and new risks that need to be managed and mitigated. Smart contracts can enhance the rule of law by allowing parties to use existing forms of structuring legal relationships to enhance their digital activities, and vice versa. Integrating the protections and coherence of legal contracting, instruments and agreements directly into the digital economy via smart contracting brings with it many opportunities to enhance the governance of data and the digital realm, and the ability of economic actors to allocate the risks and rewards of digital activity as between themselves, through legally enforceable agreements. Last but not least, the more contracts that an entity makes ‘smart’ through the incorporation of code, connections and data flows, the greater insights that entity

1 See further under our response to paragraph 2.12. For more on the nature of different forms of digitisation and ‘smart’ elements of smart contracts, see: Wilkinson, Susannah and Giuffre, Jacques, Six Levels of Contract Automation: The Evolution to Smart Legal Contracts - Further Analysis (March 30, 2021). Available at SSRN: https://ssrn.com/abstract=3815445
can derive from its dealings and the business relationships that are packaged within such a smart (and legal) contracting framework.

More organised, understandable and interrogable data on both contracts, and the activities they govern, provides many economic benefits, and will help to minimise harms or negative impacts of particular forms of structuring relationships that may otherwise go unnoticed. The contract, enhanced in this way, becomes a form of digital asset, providing not just the bundle of legal rights and obligations of a legal instrument, but also the value of its ability to automate workflows, collect organised data and structure business relationships and activities that occur through, or are measurable by, digital systems and data.

Fundamental to achieving these kinds of benefits, is ensuring that well-understood and tested legal protections, norms and principles of contracting can still be relied upon, even with the incorporation of coded components, automation, data connections and other ‘smart’ elements into a contract. A clear thread runs through our submission, advocating for methods of smart contracting and well-designed platform(s), that allow for a true integration of legal language (or at least legal principles of contracting) with the digital elements of code. Rather than aiming to exclude or minimise the legal status of a smart contract (and all the consequential protections and implications legal status as a contract provides), we believe that the most practical, and beneficial way forward for the digitisation of contracting is integration of legal language and code. This has the accompanying, and equally important impact of ensuring interrogability. Where code is linked – through whatever methodology – to legal language, smart contracting becomes more accessible to, and less risky, for a broader spectrum of people and economic actors who might otherwise be excluded from this innovation.

Our submission is based on the underlying premise that the most appropriate way forward for smart contracts is (a) to develop methodologies and legal approaches that enable them to be legal contracts, (b) enable them to be understandable to humans as well as by machines (particularly as artificial intelligence takes a more active role); and (c) for formal legal bodies and governments to be involved in (sovereign) platform and application solutions that support the rule of law and global low energy approaches³, particularly if the market alone fails to deliver solutions that promote (a) and (b).

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³ Many public, permissionless DLT platforms (by virtue of their current consensus protocols), used for smart contracts have high energy footprints which the DLA considers should be a barrier to their use and promotion.
WHAT IS A SMART CONTRACT (CHAPTER 2)

1. What kinds of contractual obligations can currently be automated using computer programs? Please provide specific examples where possible. (Paragraph 2.12)

Before directly answering this question, we provide the following introductory comments to contextualise the two ends of the spectrum from which this question can be answered:

- Ethereum-based smart contracts, particularly those used in decentralised finance (DeFi), are intended to represent the entirety of legal and contractual rights and obligations between the user and the Ethereum blockchain (a concept colloquially referred to as “code is law”, as opposed to “code of law” which refers to our existing domestic and international legal regimes). No natural language version of the smart contract code (.sol file) is generally produced although smart contract code audits (when commissioned and made publicly available) are written in natural language and specify the cyber risks identified and what action has been or will be taken to mitigated the identified risks.

- An entire, traditional legal contract (not just a particular obligation – or a part of a contract) can be made machine readable and can be tagged to structure and generate data. This is a useful first step in digitising contracts, even if the contract does not contain any code or other automation-enabling features⁴ and is also the most logical form of contracts that do contain automations.

More specifically, an entire, traditional legal contract can be:

- machine readable (that is, to have the text of its legal language searchable and reviewable by machine systems); and
- stored on an appropriate digital platform that provides a single source of truth between counterparties.

The inherent complexity of contracts and the natural interaction of different rights and obligations inside a traditional contract, means that a particular obligation should not be considered in isolation from the agreement as a whole. This dependency is relevant in considering the impact of automation on a particular obligation within the broader digitised and machine-readable agreement.

That is, once a baseline machine-readable and digitally accessible contract is live, parties can also choose to automate performance of certain obligations under a contract, connect the contract to, or allow the contract to be, a source of data and extend the contract through digitally adding automations or structured data that are of value to one or more parties.

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⁴ That is, unless and until natural language processing systems become sophisticated enough to take action based on regular legal language in a contract.
As noted above, our submission is based on the underlying premise that the most appropriate way forward for traditional legal contracts to become smart contracts is to (a) develop methodologies and legal approaches that enable them to be legal contracts, and (b) enable them to be understandable to humans as well as machines. With that in mind, to understand what kinds of contractual obligations can be automated, it is useful to consider two different ways that discrete automations (sometimes referred to as smart clauses) can be embodied within a contract to allow parts of the contract to be accessible to both human and machine. These are:

1. drafting appropriate clauses in machine readable code and logic to enable deterministic logic of the obligation to be processed by machine (Unified Method); and

2. extending a natural language clause by pairing (tagging or linking) the clause with coded automation (Paired Method).

In the case of a hybrid contract, a simplistic way to describe the difference between the methods is that the former provides a way to express a particular obligation in a unified way so that it is accessible to both computer and human, effectively the two ways to express the provision are two sides of the same coin. Whereas the latter provides a way to attach the benefits of automation to a natural language expression through pairing code with a relevant term or clause in the natural language contract.

The method of creating the smart contract, including both the platform and the user interface will be influencing factors in determining which method is used, and what parts of a contract can be subject to automation. We expect market solutions to include the option for both methods.

The Paired Method provides that the natural language expression of a particular provision/obligation is extended by virtue of being paired (connected, tagged or linked) to a corresponding coded expression of a related automation, but the two expressions do not need to necessarily match (in terms of completeness or logic). The pairing is relevant only for contractual/legal reasons not for technical functionality. For example, a natural language clause that states ‘The delivery date under the contract is 1 July 2021 and liquidated damages will be payable for every day delivery is late’, can be extended simply by pairing the clause with code that provides an automated notice advising the purchaser if delivery has not been received by 5:00pm on 1 July 2021. In this case, the automation could, but does not necessarily need to go further and address calculation and payment of liquidated damages to mirror all of the elements of the natural language clause. Rather the parties to the contract have freedom to choose where automation or the collection of shared data indicating or measuring performance adds value to the contract management process.

This method is very flexible and versatile and theoretically there is no natural language obligation that cannot be extended through automation of paired or linked code, provided the parties have appropriate technical inputs and outputs they are willing to use in respect of a given contractual process or obligation. For example, any part of a contract from the party names, definitions, calculations, business days, operative
provisions etc can be extended through the tagging of a notice, payment, API call or a calculation. This provides counterparties the flexibility to determine on a clause, and subclause, level whether the natural language or the code should take priority, and other key matters in relation to the performance of the automated provision. This also allows for unilateral internal automation from the contract into a counterparties’ internal systems that could sit outside the scope of the legally enforceable contract, in addition to shared automation that the parties may agree to form part of the contract. Shared automation is a new concept to the legal industry and the sharing of upside benefit or downside risk in the event an automation does not function properly or is subject to a cyber-attack are new matters for the legal industry to resolve.

The Paired Method may be particularly useful where existing agreements are to be automated, as automation can be gradual and evolutionary (i.e., the business concerned is not reinventing the wheel and can develop its automation over time). This will be particularly helpful where one party is dealing on standard terms where there is little room for negotiation, as the contract, once codified, will only require certain known variables to be changed for each iteration of the agreement. This may be particularly useful in the context of business to consumer transactions. In addition, the regulatory environment within which such contracts exist (noting the imbalance of bargaining power between a business and a consumer) could provide comfort to the consumer that should there be a mismatch between the written word of the agreement and the automation, an appropriate remedy would be available. This could lessen the risks to the consumer and could encourage smart contract adoption where it may otherwise seem an additional risk.

By contrast, the Unified Method requires that a particular provision is expressed in a unified representation of the parties’ agreement whether through some derived, formal language or intermediary language which provides the machine-readable logic. This may involve a clause ‘stack’ where multiple files relating to a clause are combined such as the approach used in Clause (where a text, model and logic file are combined into a single ‘.cta’ file for a given unified clause).

From a legal drafting perspective, the Unified Method is more restrictive in that it requires both the natural language and coded expression of a particular clause to be either the same expression, or very closely correlated. This means that only clauses that can be expressed in a closed loop manner can be extended through automation, for example payments, calculations, notices with strict parameters and so on; or which can be triggered by an appropriate input (for example, an external ‘oracle’ providing a trusted input). While this is valuable, it is potentially limiting in terms of the functionality available in respect of a given clause under a contract. This model may be beneficial where a business is designing new processes from the ground up, is aware of the potential limitations and can alter its processes to compensate.

Of the provisions in a contract that can be expressed in computational logic or paired to computational logic, we anticipate that the parties will ultimately need to do a cost benefit analysis particularly as there will likely be an increasing cost profile, behavioural and training shifts, and increasing complexity in the first instance for
additional automations added to a contract that will need to be weighed against efficiencies and risk requirements.

Common features identified across use cases include increased transparency and security, improved data control, authentication procedures, certainty in performance or title or asset transfer.

Key factors in deciding what should be automated include:

- The technical assessment of ability to automate – is it practical and viable to automate in a meaningful way (often dependent on whether a particular step, event or process set out by a contract can be meaningfully and reliably measured and translated into one or more data points);

- A commercial assessment of the value of outcomes produced – in particular any impacts on individuals arising from the automation (either as a result of unintended impacts of the automation or the automation going wrong, or as a result of job displacement), what is the return on investment, financial value, gains in economic efficiency, but also less direct quantifiable metrics such as the value of information-sharing between parties and, from perspective of legal practice, facilitation of collaborative legal practice, avoidance of future disputes, etc; and

- The ability to reuse the same automations in multiple agreements. The initial cost and time incurred in automation is unlikely to be attractive if the entire process has to be repeated on a bespoke basis for each agreement. However, if there is an element of consistency and the changes can be reduced to variables that merely need to be completed for each agreement (i.e. the core logic of the agreement/code does not change), then the benefits of automation are likely to be more readily achieved.

The extent to which automation is achievable also depends on the interaction between the smart or automated contract and third party systems or records. For a simple example, the triggering of a payment would involve the smart contract being connected with the banking solution to trigger an automated payment. To achieve the full benefits of automation, this would have to be capable of being completed without manual human review, but an intermediary step may be the generation of automated payment instructions with a human review before final instruction of the transfer. This can be achieved programmatically, and automated connections with the bank’s computer systems enable direct communication to effect the transfer. This approach can also be extended to situations where a definitive ownership record which can be updated by the smart contract exists – for example, title to land which is recorded on a land register, and the smart contract can instruct a transfer of title from one party to another, which is then recorded on the register.

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5 For discussion of the technical causes and potential impacts of algorithmic decision making and automation on individuals, see for example the same discussion in respect of artificial intelligence by the Australian Human Rights Committee: 'Using artificial intelligence to make decisions: Addressing the problem of algorithmic bias', available at: https://humanrights.gov.au/our-work/rights-and-freedoms/publications/using-artificial-intelligence-make-decisions-addressing
Greater difficulties arise where the action requires an action in the real world, or where the action cannot be definitively achieved by a computer system with which the smart contract can interact. For example, the ownership of many assets is by possession or chain of title rather than a definitive ledger, and where certain assets such as cars are registered, such registrations are not definitive evidence of ownership. Automation then relies on either trusted third parties holding the asset concerned (for example, title to certificated shares) or interaction with the physical world (such as physical delivery of an asset), and would therefore be dependent on certain codified, triggering actions occurring to enable completion of the smart contract. This may require changes to the existing methods of carrying on business, some of which may be beneficial in the longer term, while some may not be attractive and therefore would limit smart contract adoption.

2. **Do you agree that the Law Commission’s scoping study on smart contracts should be limited to contracts which use distributed ledger technology? If not, please provide details of other technologies which are used to support smart contracts, and their prevalence. (Paragraph 2.26)**

Distributed ledger technology (DLT) is a name that can be applied to a broad church of architectures and platforms some private, some public, some with channels, some with a single ledger, and some permissioned.

Given that smart contracts are shared and may often be or become highly valuable or critical digital assets, DLT architecture in its broadest sense is the most suitable given its immutability and its distributed nature. Having said this, this may not always be the case and other technologies may arise in time that are more suitable. We note that the less nodes involved in securing the network, the greater the actual or perceived risk of censorship and the more nodes (and thus, decentralisation) involved, the greater the actual or perceived benefits of censorship-resistance (i.e. true immutability).

It is helpful to consider through a legal lens, the preferred features and characteristics of a suitable digital platform required to best support the successful hosting and operation of traditional contracts as software. We have seen the emergence of various smart contracting platforms for specific use cases, however a more efficient course forward for enterprise and government use may be to develop national industry-agnostic digital infrastructure (rather than an industry vertical) that provides a cyber-secure, interoperable protocol for contracting and legal instruments. The *Digital Infrastructure Integrity Protocol for Smart and Legal Contracts* (DIIP 2021) sets out the “minimum best practice requirements and recommendations for any high integrity digital infrastructure or enterprise platform (EP) intended to support smart legal contracts”6 which include:

**“1. Confidentiality, Privacy and Permissioning**

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The EP should enable appropriate permissioned access to, and actions in respect of, the contract.

If an EP is hosting a Smart Legal Contract for a party, the EP should allow all authenticated parties to the Smart Legal Contract to be able to, at a minimum, have a reasonable access to view the contractual rights and obligations of that contract, whether expressed in natural language or in code (or in both).

The EP should allow all parties to agree how to control and manage data generated by the Smart Legal Contract.

The EP should support robust and rigorous identity access management with appropriate controls and standards applicable to the use of any sensitive data (including biometric data) or special classes of people (including those not legally able to contract).

The EP should ensure confidentiality of the contract including in respect of the contract’s existence, contents, history and controls. The EP should also implement controls to preserve the privacy of parties identified in the contract, and not share their personal information without consent with third parties.

2. Access

An EP does not have an obligation to host any contracts that are outside its commercial or technical domain of speciality or business model, however if all other DIIP and EP requirements are met, the EP should host any or all contract(s) uploaded and paid for by a user.

3. No change to contract without counterparty agreement.

The EP should ensure that no party to a Smart Legal Contract can form, vary or amend the contract without the agreement of the other parties.

4. Data

The EP should collect and record only the minimum amount of individual user data that is required to run the EP and the Smart Legal Contracts it hosts. To the extent possible, the EP should minimise the use of data other than for the purposes intended by the parties.

If the EP collects and uses data for the purposes of internal systems and processes, those systems and processes should be in accordance with minimum standards and sound practice guidelines.

5. Cybersecurity

The EP should have appropriate levels of cybersecurity for the nature and contents of the Smart Legal Contracts it hosts, and to enable their proper performance without unauthorised third party interference.

The cybersecurity of the EP should be supported by practices, procedures, and systems compliant to ISO 27001 (or its equivalent).
The EP should implement industry-standard safeguards and procedures to prevent unauthorised access to and the destruction, loss, misuse or improper alteration of information managed by the EP.

6. Portability, Interoperability, Reliability, Availability & Suspension

The EP should provide a technical capability for portability of the contract (including natural language, connected code, and data that form part of the contract) and interoperability with other platforms and digital systems, including platforms in other jurisdictions.

The EP must make available to users information about expected and target hosting service reliability and availability, and recommend to parties to establish a business continuity capability if there are unexpected service outages, regardless of how the party’s inability to access to the service arises.

The EP should give weight to the special status of the contract before terminating the hosting of a Smart Legal Contract. If an EP account is not paid on time and in full, and the parties have not communicated consent for an EP account to be terminated or a contract or contracts digitally destroyed, the EP should take reasonable steps prior to suspending or terminating an account or contract to give notice to the party or parties informing them of the coming suspension, termination or destruction.

7. Legal & Jurisdictional

The EP should be compliant with all applicable laws within the relevant jurisdiction, including consumer laws, cybersecurity, privacy, data collection and breach and other regulatory requirements. This includes laws that apply to the EP itself and to any extent applicable to the digital assets on the platform, including the Smart Legal Contract.”

These features may also provide courts with a useful framework for relevant issues to consider when making determinations about the context, running and enforceability of smart contracts, as the choices made by the parties in respect of the platform or system that runs a smart contract, as well as the nature of the platform or system itself, will influence interpretation of the contract.

We anticipate that the rules and governance of a platform will necessarily influence to some degree the terms of a smart contract running on that platform. For example, a permissioned platform’s requirements in terms of access, permissioning, and authentication of users may impact on a party’s ability to freely novate a contract on that platform. Or whether a contract can be amended to reverse or suspend a particular part of the code will indicate whether the contract’s running is intended to be irreversible and immutable (similar to, for example, smart contracts on the Ethereum blockchain). In the same way that clauses that specify the jurisdiction import certain legal obligations or requirements into the terms of a contract, so too in time, could the platform design and platform rules impact the terms of the contract.
3. **When, and why, do parties to smart contracts decide to use: (1) permissioned DLT systems; (2) permissionless DLT systems? (Paragraph 2.29)**

Different systems will appeal to different use cases. Permissioned systems are generally used when there is no issue of trust between the parties, and all of the parties are identified and granted access to the system. This can commonly be seen through the evolution of existing processes which parties are already confident meet their requirements (i.e. they are already entering into the relationships on the basis of reputation and regulation to ensure trust). Smart contracts are used in permissioned systems for improved efficiency and lower transactional risk that can arise from human error or single human misdemeanour. However, there will typically be a gatekeeping process where a permissioned system is only made available to trusted counterparties – i.e. trust is not the issue being solved.

Permissionless systems are used where there is systemic mistrust, i.e. in jurisdictions and situations where there is little faith in the integrity of the parties nor in the regulatory system or public institutions.

Permissionless systems are designed to avoid the need for trust in the first place – for example, a bitcoin wallet can be identified from the wallet address and the balance checked against the state of the distributed ledger. The private key is supposed only to be known to the holder of the wallet, and the design of the system is such that transactions signed by the private key are definitive. As such, in a simple payment transaction, there is (theoretically) no need to prove that the owner of the wallet is the owner (this is verified, in theory, by knowledge of the private key) and that the wallet has the requisite amount in it to complete the transaction (this is ascertainable from the ledger).

While this avoids the need for a central authority trusted to maintain the ledger, the disadvantage to this approach is it requires a level of transparency which may be unattractive (i.e. everyone can see all the transactions – albeit pseudonymous transactions – on the ledger) and a wide consensus is required to ensure the ledger is not manipulated by an individual party. The pseudonymous nature of the permissionless system started with a libertarian idea that the ledger is definitive and free from outside interference. However, this presents practical difficulties in constructing and maintaining a system which is both definitive, and provides remedies for abuse and privacy.

Looking to the future of wide-scale adoption by businesses and government in general commercial use, we expect the unique benefits of permissioned DLT systems to be a deciding factor in choice of system.

For further reference, see also our discussion of some critical features and principles of a smart contracting platform in our response to paragraph 2.26, as these may influence the choices of contracting parties.

4. **Which of the three forms of smart contract discussed in para 2.32 of the call for evidence are most commonly used in existing smart**
contracts or smart contracts which are in development? Please provide examples of how these forms of smart contract have been used in practice (Paragraph 2.39)

The three forms of smart contracts proposed in the Call for Evidence are a useful starting point for the analysis of smart contracts, however further distinctions may be useful for completeness. For example, the assessment is not necessarily one of degree of automaticity agreed between the parties, but rather agreement as to whether and where the boundaries of the legally enforceable agreement are drawn between the natural language and code.

The three forms of contracts proposed stem from an assumption that each clause should either be expressed in natural language or in code. We understand there to be an additional approach that allows a given provision to be both expressed in natural language and mirrored or extended (wholly or partially) by code, providing additional flexibility and freedom for the parties to legally agree associated matters relating to the code such as risk allocation, and in particular whether the code or the natural language take priority in terms of legal obligation.

The distinction should be made under the form of hybrid contracts between the Paired Method and Unified Method (see response to question 1). This will also help to address the confusion that can be generated when classifying the contract as a whole, rather than a decision between parties as to whether, on a clause by clause basis, the code or the natural language would take priority. Indeed, as indicated above, often code or automation is designed around a contractual process that may touch on several clauses (e.g. form of notice, delivery requirements, consequential payment requirements and milestones may each be set by a differing clause, but a single piece of coded automation allows for the tracking of a delivery, notification and consequential payment for a given delivery, and identification that a project milestone has been achieved based on delivery status, recognising that each of the relevant clauses may also contain legal content and obligations that are not captured in that coded process).

**Natural Language contract** – in which some or all of the contractual obligations are performed automatically by the code of a computer program deployed on a distributed ledger. The code itself does not record any contractual obligations, but is merely a tool employed by the parties to perform those obligations. This form would apply where performance of at least part of the contractually agreed terms expressed in natural language are subject to some automation, but the parties agree that such code does not constitute part of the contract capable of breach.

This form and approach may have some appeal in the early days of contract digitalisation due to the fact that the code effectively sits outside the bounds of the legal agreement and is simply a means of performance, not capable of breach. This avoids the legal complexity of many of the questions raised in this Call for Evidence as any coded performance of contractual obligations would be akin to that under traditional contracts (e.g. direct debit payments).

The consequence of this approach though is to pass up the opportunity for parties to apply the flexibility and rigour of contractually agreed parameters in relation to the
automated elements of their agreed performance. In other words, if the coded elements form part of the contract, key matters in respect of how the code operates in the performance of obligations can be contractually agreed and therefore legally enforceable between the parties (e.g. what happens if the data source fails, failure of code to execute as intended, who owns data generated by the execution of the code etc.).

Over time, the increased degree of separation between increasingly complex code and natural language will become progressively more problematic from the perspective of legal enforceability. This presents an unfavourable outcome in the mid to long term where the legal entity of the contract as evidence of agreement is divorced from the practical real-world digital performance of the same contractual terms.

**Hybrid** – in which some contractual obligations are recorded in natural language and others are recorded in the code of a computer program deployed on a distributed ledger (to varying degrees).

We note it is possible for hybrid contracts to cover situations where a given clause or obligation is expressed either in natural language, or code, or both. Where the hybrid contract sits on this spectrum of natural language and code will depend on the contract itself, for example, whether parties have elected, either wholly or on a clause by clause basis whether or not either expression of the obligations is legally binding and within the bounds of the contract. It will be vitally important for certainty and enforceability of smart contracts, for parties to make such elections clear in the drafting of the contract. See generally ‘Smart Legal Contracts: A Model for the Integration of Machine Capabilities Into Contracts’.

We see benefit in preserving the natural language components of a contract alongside the ‘smart’ components such as code, connections and other forms of contract automation, as the natural language provides a mechanism to provide certainty, including as between the parties of how to resolve potential conflict between natural language and code. Without clarity as to this, the risks of mistake or mismatch between the natural language and executing code have the potential to create issues in contractual interpretation, with parties taking differing positions on the impact of the natural language on the code and vice versa. This is particularly so given code – particularly in the Paired Method (see response to Question 1) – is unlikely to exactly align to the natural language. Code that is inconsistent with the natural language agreement may be construed as forming part of the ‘relevant facts’ informing interpretation, or where there are non-code elements of the contract which are relevant for determining the appropriate remedy, particularly where value judgements (which are difficult to codify) may be relevant. In addition, the entirety of the agreement reached between the parties can be recorded and stored in the same form – such that there is an audit trail which could be referred to in construction of the contract/considering disputes.

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Inclusion of boilerplate terms – similar to interpretation provisions – that provide for primacy of either the code or natural language to the extent of any inconsistencies will help to mitigate this problem, though contracts are likely to be interpreted by the court on a case by case basis such that these provisions – while of assistance – will not necessarily be the final word.

**Code only** – a contract that is recorded solely in the code of a computer program deployed on a distributed ledger. No natural language version of the agreement exists: all the contractual obligations are recorded in, and performed by, the code.

We do not see the third form of contract being likely to form a standalone legally binding and enforceable contract for enterprises and institutions in the near future unless lawyers are involved in the drafting or review of smart contract (and the broader schemes that they form part) to ensure sufficient legal wording is added in natural language text to the smart contract as well as other information and marketing dissemination interfaces such as websites and social media accounts.

Code only smart contracts may well have a significant role to play in automation of performance of obligations, but may fail as legally binding contractual representations. Even where such instruments may form contracts (to a greater or lesser degree) the design of such smart contracts creates issues for contracting parties with different levels of understanding of the coded language, may cause unfair terms or low accessibility arising from the complexity and of the code (when not tied to or governed by more understandable and certain – to human parties – language) and is subject to limitations associated with programming languages, meaning this approach is largely only applicable to simple, highly deterministic agreements. In DeFi, a suite of smart contracts are generally designed to offer financial products to individual consumers (i.e. similar to business to consumer legal relationships) rather than between sophisticated enterprises and governments.

In summary, care should be taken to clarify, but not to oversimplify, the classifications. Applications will warrant individual consideration of what obligations should be automated, and parties will need to agree whether the automation is within the bounds of the terms of the agreement, capable of breach, and to agree related issues (such as control of data, ownership of IP, recourse and responsibility in case of API, code or system failure and so on). Naturally, most agreements will demand a hybrid approach, however this encompasses a broad range of agreements with varying degrees of integration and associated nuances.

5. **How do code and natural language interact in hybrid smart contracts currently in existence or in development and which terms are generally coded? (Paragraph 2.40)**

See answer to question 1 in relation to discussion of Paired and Unified Methods.

Other factors that may interact with the code and natural language are:

- the nature of the platform the smart contract runs on - see answer to question 2 in relation to the influence of platform on the terms of the contract; and
the act of a lawyer reviewing and adding natural language text to a code only
smart contract to assist with legal validity and interpretation of the smart
contract – see answer to question 4 in relation to code only contracts.

6. What process do the parties follow (or plan to follow) in negotiating,
drafting and entering into a smart contract? (Paragraph 2.41)

Note: Please initially refer to our answer to question 1 in relation to discussion of
Paired and Unified Methods, and question 4 on the three types of contracts as those
include detailed consideration of key aspects of these issues.

There are multiple factors that will influence the process followed in negotiating,
drafting and entering into a “smart” traditional contract. These include the nature of the
“smarts”, the history between counterparties, whether it is a bespoke contract, or
adopting modular precedent or standardised clauses that have been tested and used
previously.

In a bespoke business to business agreement, each party would likely have their own
advisers (initially both legal and technological, though some convergence in time is to
be expected) and therefore the costs for bespoke agreements are likely to be high until
such time as model or standard clauses become accepted norms. However, as “smart”
traditional contracts become more prevalent, established practice and model clauses
and code will help reduce this burden, potentially with a final audit review prior to
execution to give comfort to both parties that the agreement does what it says it will
do, and has no unintentional consequences. By so doing, the burden of preparing a
smart contract could be significantly reduced, and when considered with the potential
lifetime savings brought by automation, incentivise their wider use.

In contrast, business to consumer or other contracts conducted on standard terms
could see the benefit of automation more quickly, as the substantive logic of the
agreement does not change from one transaction to the next. As such, these types of
contract are more likely to see earlier adoption as there is a greater scope to realise
the benefits of automation in the short term.

If the smart contract is modified within the relevant platform from inception to final
execution, there is also the advantage that all changes would be tracked within the
system for the lifetime of the contract, potentially with additional contextual information
(such as the information provided by the parties prior to entry into the smart contract)
being recorded if required. This would then be signed by the parties using their own
private keys.

As an alternative to each party having their own advisers, it may become market
practice to rely on a platform to provide the technical infrastructure and tools for the

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8 The call for evidence specifically asks to please explain in particular: (1) where all the contractual obligations are
contained in a natural language agreement and the code is intended merely to perform those obligations, the practical
steps involved in coding the parties’ rights and obligations contained in the natural language agreement; (2) where the
parties intend that there will be a hybrid contract or a code only contract, the practical steps involved in drafting,
negotiating and agreeing the code of the smart contract; (3) where there is a hybrid contract, whether the natural
language element and the coded element are entered into contemporaneously or at different times; and (4) the role
played by third party service providers (such as computer coders and software firms) in this process.
parties to achieve automation without the requirement for advanced technological skills. While initially contracts would likely be bespoke, once a library of standard clauses is created, there is an increased opportunity for ‘DIY’ platforms using these pre-vetted modules to construct agreements.

A further critical issue from a traditional law firm perspective is the practical implication of risk allocation, insurance coverage and contractual structures where assisting with coding internally or outsourcing coding. In particular, whether coding will be offered as part of an integrated service by law firms or by third party service providers, or technical expertise within the client. Multi-disciplinary insurance coverage will be key here, and the appetite from insurers around the world in relation to emerging technologies and their risks is still extremely conservative.

We submit that there is strong grounds for an approach to drafting in the Paired approach, that is, a conjoined manner, that links code to natural language where the natural language is contractually agreed to have primacy over the corresponding code. This will be required for commercial or enterprise grade contracting in the broad sense allowing for certainty and understanding in relation to the intention of the parties.

7. Are you aware of any examples of use cases for smart contracts beyond those we give in the call for evidence, or variations on the use cases we give, which are being developed, are at proof of concept stage or are already operational? (Paragraph 2.64)

We do not have direct knowledge of smart contracts in operation beyond those in the Call for Evidence. There are various examples in the market of unilateral automation but we could not consider these to be smart contracts in the way that term is defined for the purpose of this Call for Evidence. Some examples of such initiatives that may merit further review that we come across through publicly available information include:

- Smart flood insurance – example given by Lloyd’s of a smart insurance ecosystem. This is intended not only to automate payments/calculation of premiums, but also to operate as a personal risk management mechanism by way of a system of notifications sent to the insured.9

- Leasing - facilitating automated payments, for example rent and return of bonds, as well as verification (highly valuable in lease market).10

10 Robert Size, ‘Taking Advantage of Advances in Technology to Enhance the Rule of Law’ (2017) 91 Australian Law Journal 575, 580-581. Note: at the time of drafting this submission we are unsure how developed this application is, though there is some industry commentary: https://deloitte.wsj.com/cfo/2018/01/03/blockchain-and-smart-contracts-could-transform-property-transactions/. See also https://www.lexology.com/library/detail.aspx?g=b257ef57-4296-4f2a-a327-f34441a58b5d
8. What benefits and cost savings can smart contracts provide compared with traditional contracts? Will increased use of smart contracts lead to any additional costs? Please provide details and any available qualitative and quantitative evidence (Paragraph 2.66)

In principle, the implied benefits of any machine-readable and rule-based self-executing contract, including ledger-based smart contracts, lie within the realm of automation efficiencies, speed of transaction or actions taken in response to a specified trigger, immutable record-keeping, structured data generation and capture, process optimisation, standardisation, risk mitigation, and value creation.

Assuming that open, interoperable standards become established (and adopted) so as to enable contracts to be accessible, a key benefit will be that all the parties associated with the contract would have secure unfettered access to the contractual record, and have certainty as to the true version and status of a contract.

In the case of a single static agreement where any amendments, additions or access logs would usually be infrequent, and which does not have any automation or code, then the cost-benefit of the smart contract is less significant at a micro level, but may offer value at a macro, enterprise level as it enables stronger record hygiene, searchability and analysis capabilities across the contract load. The cost-benefit analysis of including code and automation in a single contract must be done on a case by case basis, and acknowledging the higher costs of creating those initially when platforms, skills and precedents are less developed. However, if most of the construction of the contract can be automated and the use of an open library containing tried and tested contract formulas, including pre-formatted articles in both natural language and computer code, then the unit cost could drop dramatically and the quality of the contract increases.\(^\text{12}\)

Based on our experience of current vendor development and market readiness, the most likely and accepted end-state for commercial-scale adoption is centred around the notion of a living, dynamic smart contract that contains agreed executable rules and decision-based logic between multiple parties within the context of an end-to-end business process containing multiple procedures. The executable actions can be a mix of digital automation and human tasks, but the intention in some cases is to minimise or eliminate human intervention, labour or error rates. The key benefit of this aspiration becoming realised centres around real time, frictionless, secure and faultless processing. Should this vision be fully realised where the smart contract becomes the single point of truth as between the parties, then the cost-benefit for an appropriate use case is significant. Apart from dramatically reducing the transaction costs of mutable market supply chains, the time frame of completion involving multiple stages of, say, purchasing a property could be, according to vendors, reduced from months to


\(^{12}\) For example https://www.openlaw.io/ is working towards such outcomes.
seconds. This approach also negates the need for a supply chain to pay the very high cost of centralised system integration of all the computer systems associated with the tasks prescribed within the smart contract.

Beyond the practical-level benefits outlined above, on the macro-scale the key benefit that a well-integrated, well-functioning smart contract economy will provide is the capacity of the smart contract to integrate law and legal structure into the evolving digital architectural landscape which our economics are becoming significantly and systemically dependent upon. A wicked problem currently exists that inhibits our cities and regions from benefiting from the ongoing digital transformation journey of economic activities. This problem centres around moving from the waypoint of interconnectivity we enjoy today, towards fully automated, efficient, and effective sectors where digitised market liquidity becomes a possibility. The construction of digitally-created tradeable assets, through legal instruments such as smart contracts, can produce new types of capital to strengthen our fragile post-COVID economies, whilst laying down the foundations for greater resilience to shock, as they enable stronger data flows and reaction times to allow economic activity to prepare for and respond to such shocks.

What is still required, however, is evidence of meaningful, validated impacts upon individual actors, business, market sectors and economies of the claimed benefits within the broader context of the use of smart contracts. Without such evidence, it is important that any regulations or legal structures created to deal with smart contracts are structured to accommodate a broad range of methodologies that achieve similar outcomes, rather than being limited to a particular conception or preconception of ‘smart contracting’, in particular one that is founded on use of blockchain or DLT systems.

In the absence of properly developed, (most likely private and permissioned) smart contracting platforms, clear and quantifiable smart contract efficiency data is difficult to find and cost savings on public blockchains need scrutiny (particularly if moving into enterprise complexity and large volumes of transactions). This is particularly true where the currently available technical solutions (public blockchains and off-chain solutions) are not considered safe or appropriate for smart (and legal) contracts. Yet, due to the higher cost and complexity for contracts and the associated records to be stored on a chain for some forms of blockchain, currently the majority of the data is kept off the chain.

The estimated cost ratio of programming on public blockchain systems was around one million to one when compared to programming in Java. This dichotomy presents a real problem of scalability, environmental impact and cost. The Ethereum blockchain has set out to solve this problem by increasing the number of chains, switching to a proof of stake model and eventually creating a greatly improved smart contract model. The time frame for this is not clear, but the indication is that we are a few years away from the problem being solved in respect of Ethereum or other public-style blockchains. It may be wise to determine the time frame as well as the probable costs before making any assumptions that may impact any regulation.
The acid test is how much would it cost to create and operate a live smart contract in the context of a supply chain of, say, purchasing a home when every execution of a rule or decision has to be added to the chain. Just the cost of making an addition to the chain can (historically) cost USD 20, for these styles of public chain. This then gives rise inevitably to the question of what the total cost to the industry would be when every automated transaction is charged by some sort of blockchain middleware service. We cross-reference the central bank digital currency (CBDC) discussion at this point to note that the data and transfers of value associated with the movement of goods and services through a supply chain could be captured by a domestic CBDC that is interoperable with other country CBDCs. Latest research by the Bank of International Settlements suggests that within the next three years, general use CBDCs will be issued to at least one third of the world’s population. Absent legal certainty and clear smart contracting legal principles, perhaps inhibiting enterprise and corporate uptake of smart contracting, the momentum of CBDCs will add pressure to the need for certainty and clear principles around smart contracts that allow for the programmability of CBDCs.

Following on from these concerns, we anticipate other market (or publicly financed) solutions will emerge that leverage greater efficiency and economy to solve for this problem. In particular, styles of permissioned or hybrid DLT structures that do not require the more intensive processing power or architectural structures required to sustain the particular ‘trustless’ nature of public blockchains.

A traditional cost-benefit analysis cannot answer the question of ‘will it work?’. This is because a positive benefit may well be indicated, and yet, when the context of using a smart contract is factored into a value equation, the result may be a negative value to critical parties whose participation is required for a critical mass of adoption. Again, this is where we suggest that there may be a case for public investment in securing the future of platforms that support secure legal instruments. Like the governments have responsibility for road and rail infrastructure, so too is the case becoming increasingly urgent and compelling that governments should have responsibility for secure and reliable digital infrastructure.

Ultimately, while there are benefits to the utilisation of smart contracts, the practical consequences of adding contracts to a public-style blockchain with high processing power requirements is to result in significant energy resource production that, for the foreseeable future, will impede scalable adoption. A key factor in assessing the value of smart contracting moving forward will be the nature of the DLT or other systems and platforms available to enable it. For more on this, see our answer to question 2 above, which outlines some of the key requirements for any such smart contracting system of scale.

An example of how smart contracts could have a beneficial impact at scale upon the public sector centres around the need to determine the correct address when establishing an account, with such data then being used to process any customer-centric service such as eligibility, status and request.
Despite significant investment by governments worldwide on centralised identity management systems, establishing a single point of truth devoid of risk remains elusive.

This problem is exacerbated by centralised systems' inability to enable a customer to update all governments' records of a change of address with sufficient confidence by all parties that all required legal processes or obligations have been met and recorded accurately.

A smart contract structure may enable a tell-it-once capability within a government department and allows multiple systems across government (and beyond) to interact with a single point of truth without the high establishment cost or overhead of complex systems integration.
9. **In what ways can parties reach an agreement through their interactions on a distributed ledger?** (Paragraph 3.13)

There is no technical reason that a bespoke and well-designed smart contract platform cannot support parties to reach legal agreement in the same way as they do now. Particularly if that well-designed solution allows for the organic interaction of natural language and code. Whilst the way parties reach agreement now is familiar, we question whether it is the best way for all members of society. The only difference between current practice and agreement on a well-designed DLT solution is that digital legal execution and performance events would be recorded, such that they would create a single source of truth of that agreement’s lifecycle (audit trail). This is conceivably superior to the current analogue method and will for example, be of great use in supporting legal variations.

Much depends on the technical or legal ‘rules’ established by the underlying DLT, or platform, either through technical design or terms and conditions which set out how users may interact and transact with each other. Parties’ level of knowledge, acceptance and use of these rules and systems will influence interpretation of whether an agreement has been reached. In contrast, in code only smart contracting platforms like Ethereum, there continues to be heavy debate between what prevails when something goes wrong: “code is law”, “code of law”, or “intent of code is law”? We are aware of one matter proceeding through an Australian court that is considering the applicability of “code of law” where an Australian regulator has a published view that effectively endorses “code is law”.

Moving to consideration of public blockchains and how they might help (or not help) parties reach an agreement, they can technically replicate existing processes for reaching an agreement, and mimic any type of decision and rule table to fully automate the interactions between parties, including reaching an agreement. Often times though, the parties will need to include human decision making as required as part of the transaction when full automation is not possible or preferred. To date, the Ethereum-based smart contracts used in DeFi and entertainment/gaming, are purposely one-directional - there is no party to negotiate with because a person merely interacts with the smart contract code. Whilst there is no negotiation, an increasing number of consumers are attracted to the simplicity, transparency and affordability of DeFi notwithstanding the cyber risks associated with smart contracts. A suite of smart contracts can be designed and deployed to operate as a decentralised application (dApp). Decentralised models of governance have become the mechanism for negotiation, whereby code-literate users of a DeFi application can submit a proposal to the governance council (usually a group of people elected by the governance token holders) to change an element of the smart contract that results in a better or fairer DeFi offering. If the proposal is voted in by the council, the new smart contract is deployed.

The reality is that when most people speak about a smart contract (particularly in the computer science or coding domains) they are referring to self-executing code on a
public blockchain – more often than not, what they are describing does not have all the features of a legally binding agreement, nor is that what they are intending to create. In this instance, the smart contract is more like the automation of an operative clause, rather than a whole contract.

The following examples give colour to the smart contract versus smart (and legal) contract distinction as it sets out the automated clause (rather than legal contract) method. The scenario in paragraph 3.6 assumes that Bob is code-literate and understands the application of a public blockchain. However, consider the example where Bob is not code-literate. In such a case, Bob needs to interact with Alice’s smart contract through a user interface, like a website or an app to do the specified actions (e.g. send ETH, receive X token). In this example, the assumption is also made that Bob would send ETH and receive an ERC-20 standard token in return, unless Alice’s smart contract was sophisticated enough to enable cross-chain token swaps. The addition of a user interface in between Alice and Bob may introduce complicating factors in the formation of the agreement.

Some similar real-world “smart clause” as a “smart contract” examples include:

1. Purchasing non-fungible tokens (NFTs) on a virtual marketplace (e.g. OpenSea or SuperRare). Bob identifies a collectible he likes on the marketplace. Bob sends ETH to the site and receives a unique NFT in the same ETH wallet. The NFT represents whatever rights or attributes are associated with the collectible. Sticking to the scenario, let’s assume Alice coded the smart contract that facilitates the transfer of NFT tokens to a buyer’s ETH address.

2. Alice developed the smart contracts that enable liquidity providers on decentralised exchanges (DEXs) to contribute both sides of a pair to an existing or new liquidity pool (e.g. an ETH-YYY pool) and for persons to subsequently interact with the liquidity pool to swap ETH for YYY token, and vice versa. Here, Alice is the equivalent to Hayden Adams of Uniswap. Bob sends a specific amount of ETH and understands that he will receive the equivalent spot value of ETH he sent in YYY token. Bob receives YYY tokens to the same ETH wallet he sent ETH from (same as the NFT example above).

In both of the above scenarios, it cannot be expected that Alice assumes, expects or knows that Bob will buy the NFT or YYY tokens. Alice altogether has a minor role in enabling the transactions to occur on the platforms by virtue of coding the smart contract. It can be argued that Alice had no direct role in any agreement that Bob may have reached with the platform to receive the NFT or the interface to receive YYY tokens. Rather, the smart contracts allow users to “self-deal” by interacting with the smart contract in only the way the smart contract permits.

The NFT marketplace or DEX may be making an offer to treat to the world at large by offering users the opportunity to purchase an NFT or a token listed on a DEX. An argument can be made that when a platform user or website visitor signs the transaction (e.g. ‘Confirm’ the transaction in Metamask, a browser based wallet), they are accepting the offer.
Consider the scenario where an NFT or a token on a DEX is no longer available. However, the platform or interface shows that the NFT or token is still available, so the user assumes the NFT or token is available. This might be an interface fault, an attempt at fraud by malicious actors, or a lag between updating the interface with information from the underlying distributed ledger. The user proceeds to sign the transaction. If the NFT or DEX token is not available, the transaction will fail and the offer will be rejected. The smart contract can’t issue something that doesn’t exist. In some cases the ETH required to fund gas that fuels the operation of the smart contract will be expended.

10. Are you aware of programming languages which are specifically designed to enable parties to reach agreement on a distributed ledger? If possible, please give examples of the circumstances in which they could be or have been used (Paragraph 3.14)

The DAML example in paragraph 3.12 just allows for an offer to be made to a specific user. We do not consider that a specific programming language is necessary to reach agreement on a distributed ledger. Rather, for DeFi applications with decentralised models of governance, generally an author of a proposed change or upgrade to a smart contract is responsible for gathering consensus from within the DeFi application’s community and collating dissenting opinions before the proposal is put up to be voted by the governance council. Such “soft governance” is human-led, largely through social media channels and video calls with interested parties.

There are programming languages we have seen that are designed to help parties reach an agreement on a distributed ledger. There are some programming languages that can help form and run smart contracts which may be used in conjunction with a distributed ledger. Specific programming languages for smart contracts should not be necessary if drafting contracts on a well-designed smart contract platform that supports natural language and a low code environment.

The Linux Foundation's Accord project has developed the Cicero and Ergo programming languages targeted at legal use cases. To our understanding, these programming languages, despite their being targeted at legal use cases, have not been widely adopted by Australian law firms.

11. Do you consider that offer and acceptance can occur through the operation of autonomous computer programs deployed by the parties on a distributed ledger? If so: (1) in what circumstances? (2) on what legal basis? (Paragraph 3.20)

There is no technical reason that a bespoke and well-designed smart contract platform cannot support offer and acceptance in the same way as an offer is made and accepted now. The ability for truly autonomous computer programs to do this may not be useful, or necessary in most enterprise to enterprise or enterprise to government circumstances. In fact, in these cases the law is probably best served in the conceivable future where offer and acceptance are still human in the loop features –
particularly of an original genesis legal agreement that underpins future contracting cycles (variations) and performance of obligations under a legally binding agreement.

It is theoretically possible for the operation of the autonomous program(s) to amount to offer and acceptance, particularly where a human has sanctioned the originating cycle of contract. The parties remain the parties with the autonomous program enacting actions according to the underpinning logic and criteria which the parties have set (or at least agreed to). There may be circumstances where a party argues that the logic of the programs did not operate as intended resulting in a potential issue or mismatch in the offer and/or acceptance. This is particularly a risk where the autonomous computer program is not created, owned or operated by the party, for example where it was programmed by a third party, or a platform provider. It is important to consider – particularly for mistake in formation of contract – which is the relevant state of mind; that of the party, or the programmer? See also the case of *Quoine Pte Ltd v B2C2 Ltd*. ¹³

Some further questions to consider include: what the broader policy impact is of differentiating between human actors and autonomous programs? In these types of cases, where an autonomous program is acting on behalf of a human or corporate actor, responsibility can still be traced back to the legal personality. However, there are likely to be cases where parties argue that autonomous programs did not act on their behalf, or where autonomous programs act on their own behalf. In what manner can such actions still be traced to a legal personality or structure?

12. **How common is it for parties to enter into smart contracts on a DLT system without knowing each other’s real identities and in what circumstances is this likely to arise? Paragraph 3.25**

**Commercial, traditional contracts**

A bespoke and well-designed smart contract platform would have sophisticated permissioning, identification and authorisation of those parties who are users of smart legal contracts. See DIIP 2021 (set out above) that defines this as a critical element of a high integrity platform.

While there may be certain use cases for pseudonymity in smart contracting, either deliberately or because identity is immaterial to the nature of the transaction, for smart contracting to be the evolution of commercial contracting, identity will be a prerequisite for legally enforceable smart contracts absent some other safeguard in terms of remedies in case of breach. Where sophisticated contracting parties are using smart contracts for the benefits of automation, the use of their real identities is not generally raised as a threshold issue.

**Ethereum-based smart contracts**

Knowledge of identities or at least, blacklisted and whitelisted addresses is a threshold issue for DLT system transactions. It is common for crypto-literate persons to interact

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¹³ [2020] SGCA(I) 02.
with the smart contracts on a DLT system not knowing who the original programmer was or if the smart contract is subject to a proposal for change. Until recently, a number of decentralised applications (dApps) were designed as peer to contract (e.g. MakerDAO) whereas now we are seeing a proliferation of dApps designed as peer to contract to peer (e.g. Aave, Uniswap, Sushiswap). Whilst the P2C2P smart contracts raise concerns about “washing” (i.e. an attempt to clean laundered cryptocurrency) because they are similar in function to mixers and tumblers, crypto-literate persons continue to interact with the smart contracts because of the yield (or return) available from the interaction. No agreement is entered into per se; rather, persons interact with the smart contract because of the actual or perceived clarity and simplicity of the mathematical and financial functions. Identity is not currently a prerequisite for most dApps (although this may change soon based on latest proposed FATF recommendations) but is required at the point of obtaining insurance cover for loss suffered from a dApp through offerings like Nexus Mutual.

In addition, most order-book based digital currency exchanges do not reveal any identifying data, nor the wallet addresses, of the counterparties to a trade.

The following component of our response is a discussion on identity in the absence of a bespoke smart contract platform and using public blockchains e.g. for Bitcoin or Ethereum where identity is generally considered to be pseudonymous and can be a road block to legal dealings.

**Current use (cryptocurrency):**

The onus on ascertaining the identity of the other contracting party, if necessary to know the identity at all, is generally held by the offeror. For example, if one person wants to send cryptocurrency to a specific person, they should do their due diligence to ascertain the correct address of the recipient person. Similarly, if a person needs to interact with an exchange or a platform, they will obtain the relevant address from the exchange or platform’s website. Outside the case of airdrops, it is extremely rare for people to send cryptocurrency to random addresses. Individuals generally do their due diligence and small test transactions to ensure that the address belongs to the intended recipient. And if it is incorrect, the loss is borne by the offeror/sender.

Digital identity initiatives may link DLT addresses to particular individuals in the future. ENS names on the Ethereum blockchain come close to a global digital identity service, but ENS names can be claimed by anyone, so it is not a reliable form of identification.

**Key principles and practical concerns for the future**

CBDC discussions continue to draw attention to the anonymity of cash and an individual’s right to privacy by choosing to use cash rather than other means of payment that involve the capture and sharing of data about transactions. Each country’s design of their general use CBDC will have to make a trade-off between appropriate surveillance and anonymity.

The question of pseudonymity and anonymity of commercially transacting parties is somewhat premature, because the use of smart contracts is still at such an early stage in the market and is not often intended to be trying to capture a formal legal
commercial agreement. So many commercial agreements currently are formed using an individual’s or entities’ real identities. To create the ability for individuals or entities to engage in a smart contract transaction anonymously (to replicate cash transactions) would require a philosophical shift from how the parties commence commercial contracting in the first place.

Practically speaking, the extent of knowledge each party to a smart contract has of the other’s identity depends on the compliance requirements for the DLT system: for example, with Public Key Infrastructure, as long as a party has established and recorded bono fides status by a given authority, then the requirement of the system is simply to ensure the same party originally identified is the same party as the one transacting. Anonymity or the use of personas are common in the current use of, for example, cryptocurrency-related smart contracts, but for broader usage, the use of identification requirements will likely be stipulated by the requirements of the legal agreements and not by the constraints of the technology itself. For example, the requirement to include a witness for certain types of agreements or deeds may be a limiting factor on maintaining anonymity within a smart contract on a DLT system. Finally it is important to note that total anonymity is considered to not generally be possible due to the systems that can observe other systems and deduce identification details.

13. **What evidence might be available to a court to establish the identity of the parties to a smart contract entered into pseudonymously on a DLT system? Paragraph 3.26**

In general business contracting, private and permissioned DLT systems are likely to support some form of identity verification to promote more traditional business interactions between known counterparties. This could be achieved using third party KYC providers who verify identity and add data to the DLT system to demonstrate the identity has been verified. This approach is not without issue, however, as the compromise of private keys to a system would allow an actor, other than the person who has been verified, to conduct transactions on the network under the guise of being the verified person. There are various mitigation techniques (such as two factor authentication, key rotation, multisignatory requirements for transactions on behalf of legal entities, etc.) that can be used, however the definitive link is between the account and the private key rather than the individual concerned.

The compliance requirements set out by a particular generally public DLT system or platform for the establishment of a user account will form the extent of the information available to a court to (seek to) establish the (true) identity of the parties to a smart contract. If the account establishment requirements permit pseudonyms or the hiding of true identities then the court will be limited to being able to identify the details of the pseudonym as verified at the time of establishment of the account.

That being said, numerous companies specialise in chain analysis, and can accurately link addresses to individuals, particularly if the address sent funds to an exchange or platform that performed Know Your Customer (KYC) or other forms of regulatory identity checking. If, however, the tokens belong to a privacy-centric blockchain like
Monero or Oxen, or if the tokens are sent through a mixer or peel chains, it is much more difficult to trace the identity of the owner of an address.

However, we note that it is highly unlikely that an individual will send tokens to a random address. If a platform lists the incorrect address, and the sender sends tokens or interacts with the incorrect address, the next step would be to track down the individual responsible for the platform, or the individual responsible for providing the incorrect address, which may provide the necessary information. In addition, the recipient address could be watched to identify where and when tokens are moved and to which other wallet addresses.

Courts or parties looking to establish the identity of a pseudonymous user can employ tools such as: investigating who registered the website, engaging a chain analysis company to track down where the funds were sent to onward from the incorrect address, and examining the public social media profiles of the platform.

14. Are you aware of, or do you foresee, any difficulties in applying the law on consideration to smart contracts? If possible, please provide examples. Paragraph 3.30

If participants of a smart contract want it to be legally binding in a common law jurisdiction they should endeavour to satisfy the element of consideration. We see no reason why smart contracts should not accommodate this, either through the smart contract code or through natural language.

In the context of smart contracts as used for the purposes of this Call for Evidence, there is no reason why parties to a smart contract cannot establish consideration in the formation of a legally binding agreement, although it will require express agreement by the parties, and most likely best practice will require this to be included in natural language provisions of the smart contract. An appropriate digital platform that supports formation of smart contracts should also provide for payment infrastructure to support payment and evidence of consideration under the smart contract.

However, where automation or code is enacted between two parties and is only one part of a wider business transaction or relationship rather than being documented in a smart contract, it may be difficult to establish that consideration was paid in relation to the automation. In such cases, the arrangement would fall short of the legal requirements for a smart contract due to the failure to establish consideration.

In the context of current DLT users, many if not most do not consider DLT transactions to be legally binding contracts, which is the key difficulty in applying the law on consideration to current uses of those smart contracts. Users are not occupied with satisfying all contractual elements, and ensuring the transaction is legally binding. Rather, users of these systems expect the code to execute what it says it will execute when a certain act is performed. In addition, there are not traditional counterparties in a smart contract arrangement – a person interacts with smart contract code that has been deployed to a DLT system secured by a decentralised network of nodes.
15. Are you aware of, or do you foresee, any difficulties in determining whether the parties to a smart contract have reached a certain and complete agreement? If possible, please provide examples. Paragraph 3.35

The complexity of the technological processes and technology stack which support the running, and indeed the existence, of a smart contract are a potential source of uncertainty. Where the contract itself only exists on a digital platform, there becomes a question of what exactly comprises the content of a smart contract: is it just the agreed code and contents of the contract, or the underlying technology stack which hosts and impacts the manner in which the code is both expressed and implemented? Much will depend on the terms of the contract itself and whether it expressly deals with such issues (for example through natural language terms, similar to those which deal with governing law), and on the terms and conditions of the DLT system the contract is on (either express or implied terms and conditions, including through the functional design and capabilities and limitations of the system, and whether the parties are able to be taken to be objectively aware of such capabilities and limitations).

A possible solution to this uncertainty is for the parties to expressly record in the natural language provision of the smart contract their agreement in relation to the code (for example that natural language provisions have priority to the extent coded provisions relate to performance of the same clause).

16. Are you aware of any instances where the parties to a smart contract have expressly agreed that they do not intend to create legal relations? Paragraph 3.46

We are not aware of instances where parties to a smart contract (in the way that term is described for the Call for Evidence) have expressly agreed they do not intend to create legal relations. In DeFi, we do see a number of disclaimers and where incorporated entities exist alongside a decentralised protocol the employees of those entities are extremely careful to ensure they do not act in a way that would look like the protocol is centralised and under the control of that entity.

As noted above in respect of paragraph 3.25, often parties do not intend or indeed care whether a smart non-legal contract (as distinct from a smart contract) also forms a legal contract. Unless smart contracts are considered at law to constitute legal agreements or relations, the general consensus amongst DLT users is that transactions do not automatically constitute legal agreements or relations, they are considered to be merely exchanges. However, this may not necessarily be the case, depending on both the content and context of the smart contract.

Indeed, often smart contracts are run in tandem with broader legal agreements that influence the legal status of those smart contracts and their effects, even where parties do not necessarily intend to create legal relations. It is important to distinguish between instances where parties deliberately intend not to create legal relations, from instances where parties seek to clarify the absence of a legal right within the broader context of potentially binding legal relations. One specific example may be the licence text
associated with NFTs. Such licence text expressly provides that the transfer of the
NFT does not also transfer copyright or IP rights associated with the creation to the
recipient, and that all IP rights are held with the creator. Dapper Labs was among the
first to draft such licence terms. Theoretically, these licence terms can be included in
the metadata of the NFT transaction itself. For Dapper Labs to be able to enforce the
protection offered to the creator by the exclusion, i.e. for the exclusions to be binding,
the acceptance of the licence term would need to be within the context of broader legal
relations.

17. **Do you foresee any difficulties in ascertaining whether parties
intend to create legal relations when they transact with one another
on a distributed ledger? Paragraph 3.51**

Yes, there are potential difficulties in certain use cases for smart contracts. For
business contracting we recommend best practice is for the parties to retain natural
language provisions with the smart contract that evidence intention to be bound and
hence address this issue.

18. **Do you consider that source code could meet the definition of
“writing” in the Interpretation Act 1978? Paragraph 3.62**

Examination of this topic includes the following key points:

- “Writing” as defined by the Interpretation Act 1978 (Interpretation Act) includes
  ‘typing, printing, lithography, photography, and other modes of representation or
  reproducing words in a visible form’.\(^{14}\) This is a non-exhaustive definition. Nearly
  20 years ago in 2001, the Law Commission (Commission) interpreted the phrase
  “words in a visible form” as limiting the whole of that definition.\(^{15}\) The Commission,
  therefore, concluded that while emails and website trading can fall within the
  category of other modes of representation or reproducing words in a visible form,
  the exchange of digital information designed to be acted upon by the software of
  the recipient system without the need for human intervention (known as EDI) could
  not. This is because of the impossibility of viewing EDI information in a ‘readable’
  form.\(^{16}\)

  In reaching this conclusion, the Commission referred to the dual form of electronic
  information – first, as displayed on a screen and second, its binary machine
  readable form in which digital information is transmitted or stored. Underlying
digital information could not satisfy the requirement of writing but the alternate
  display of the information on a screen would satisfy the requirements of the
  Interpretation Act definition.

- Some 20 years later, the UKJT again focused on the possibility of viewing visible
  form of ‘words’. In its view source code is likely to fulfil the requirements of “writing”

\(^{14}\) Interpretation Act 1978, s 5, Schedule 1
\(^{15}\) Page 8, ‘Electronic Commerce: Formal Requirements in Commercial Transactions’
as per the Interpretation Act provided that it can be said to (i) represent or reproduce words and (ii) be made visible on a screen or printout.\footnote{17}

In the context of source code, the key area of interrogation, therefore, appears to be whether or not the code can be said to represent words and be represented visually such that a party can understand its meaning.

Source code (as compared to other lower-level languages such as assembly code or binary code) is generally considered the highest-level code for a computer program. It uses a combination of words and symbols and is the most easily human-readable form such that human programmers can read and edit the text. An example of a specific language written for smart contracts includes Solidity. When agreeing on the terms of a smart contract, it would almost certainly be the case that parties agree to the terms as they exist at the level of the “source code”.

That code is written through either a lawyer with technical expertise in the relevant programming language or through a combination of lawyers and programmers working together to represent the parties’ intentions. Often in DeFi, lawyers are not involved in the design and drafting of smart contracts. However, this is slowly changing and will likely increase in pace as the FATF recommendations are finalised and implemented by various participating countries.

One interpretation is that this process is not so different from the process of taking high-level commercial principles and transposing them into a physical legal contract written in a natural language. Lord Hodge JSC for example noted that “so long as the operation of the computer program can be explained to a judge who, like me, maybe deficient in our knowledge of computer science, it should be relatively straightforward to conclude that people who agree to use a program with smart contracts in their transactions have objectively agreed to the consequences of the operation of the “if-then” logic of the program”.\footnote{18}

There is of course a possibility that where there is an error or a bug in the process of compiling the source code to the machine-readable code such that the behaviour of the code when executed does not reflect the expected behaviour of the source code, as discussed below in respect of paragraphs 4.15 and 4.30.

If the parties are able to open and visibly review the source code (notwithstanding whether they have actually done so) then similar to a contract concluded by email, this could fulfil the current requirement of “in writing” provided that the source code and any other visible content represents the entirety of the contract. Leaving aside issues relating to consumer contracts, the fact that code may not be readily comprehensible to one party is not determinative of whether the code fulfils an “in writing” requirement.

\footnote{17} Geoffrey Vos, Lawrence Akka, Nicholas Green, Richard Hay, Peter Hunn, Mary Kyle, Christopher Woolard, Antony Zacaroli, ‘Legal Statement on Cryptoassets and Smart Contracts’ (November 2019) 8. accessed 06 March 2020) at p 38, paragraph 164.

just as a contract written in one natural language may not be able to be read by a given party without an expert translator.

The Digital Law Association also draws the Commission’s attention to similar common law requirements of writing where it may be argued that the test of whether an instrument fulfills a “writing” requirement is broader. For example under Australian federal legislation “writing” refers to “any mode of representing or reproducing words, figures, drawings or symbols in a visible form”. Australian state-based acts such as the Acts Interpretation Act 1984 (Victoria) feature a similar definition. Arguably this is a broader definition because the requirement that words be represented or reproduced also extends to figures, drawings or symbols in a visible form.

19. Do you consider that parties can “sign” an agreement recorded solely in code? If so: (1) are you aware of technologies that are currently in use or under development to facilitate the signing of agreements recorded solely in code? (2) please provide any examples from your experience of where the parties have signed an agreement recorded solely in code. Paragraph 3.66

Do you consider that parties can “sign” an agreement recorded solely in code?

Under English Law any method of signing (including electronic signature) may be valid so long as its performs the function of a signature i.e. to authenticate the relevant instrument (see Ewan McKendrick, Goode on Commercial Law, 4th edition, 2010, Penguin Books, pages 81 – 82)’

Following the implementation of the Electronics Signatures Directive (Directive 1999/93/EEC) and Electronic Commerce Directive (Directive 2000/31/EC), into English law by the Electronic Communications Act 2000 and the Electronic Signatures Regulations 2002, SI 2002/318, a signature is a method for a person or organisation to identify itself and: (i) to authenticate the electronic data; or (ii) to agree to or approve the contents of electronic data, to which the electronic signature is attached. (see also Law Commission ‘Electronic execution of documents’ Law Com No 386 3 Sep 2019)

Where a smart contract consists solely of code, parties may sign that contract by applying a digital signature to authenticate code deployed on a DLT system. This would fulfil the requirements of the ECA and eIDAS. Each participant has a unique private key that only they can use to initiate transactions on that DLT system. This key can be considered evidence that someone with access to that private key executed the transaction.

Notwithstanding that for some classes of documents, it is not possible to use an electronic signature (e.g. documents that need filing with the Land Registry), the UKJT noted in its 2019 legal statement that a statutory signature requirement is “highly likely” to be capable of being satisfied by using a private key, because an electronic signature which is intended to authenticate a document will generally satisfy a statutory

19 Acts Interpretation Act 1901, Part 2 2B.
signature requirement, and a digital signature produced using public-key cryptography is a particular type of electronic signature.

The DLA agrees with the approach of the UKJT.

Some examples from other jurisdictions where digital identity or other methodologies have been adopted to allow for the entirely electronic approval of transactions include the below. While these may not be directly equivalent to ‘signing an agreement in code’, these examples demonstrate the continuing trend towards acceptance of alternative, non-traditional forms of authority and identity being asserted to that of a signature:

- In Australia it is currently commonplace to establish digital identity, and the Commonwealth Government has mandated standards for that to occur, as can be seen in “The Trusted Digital Identity Framework”.20

- The Australian “My Health Record Integration” via API (application programming interface) enables business systems to interact with the government’s core systems data. For example, the API enables third party applications to obtain the required ‘informed’ consent to access core data and then attach or link core data points to the third party application’s records using machine readable data plus manual data.21

- The Australian New South Wales Government has committed to transition entirely to eConveyancing. The Real Property Amendment (Certificates of Title) Bill 2021 includes a proposal to abolish all real estate certificates of title (CTs). The Bill was introduced into the NSW Parliament on 17 March 2021. If the legislation comes into effect, all existing paper CTs will be cancelled and paper CTs will no longer be issued. Notwithstanding the abolition of paper CTs, the Torrens Title Register will continue to be the single source of truth as to the ownership of real property, as it has always been. However, the abolition of paper based CTs will mean that the manner of establishing what is on the Torrens Title Register will change.22

If so: 1) are you aware of technologies that are currently in use or under development to facilitate the signing of agreements recorded solely in code? (2) Please provide any examples from your experience of where the parties have signed an agreement recorded solely in code.

Parties to a smart contract transaction apply their digital signature in order to sign the agreement. Applying a digital signature to a transaction equates to signing an agreement solely in code. Please refer to OpenLaw for recognisable legal contracts

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that apply this methodology. Applying a digital signature is no different to electronically signing a document in DocuSign.

The application of a digital signature can be simplified (or complicated) by blockchain wallet user interfaces. In Metamask, the user simply needs to ‘Confirm’ the transaction in order for Metamask to apply the digital signature. Metamask is a free to download browser based wallet which can be connected to a website in order to initiate the transaction.

20. **Do you think that smart contracts using DLT are currently able to utilise eIDAS compliant advanced electronic signatures and qualified electronic signatures? If not, how do you think they could be designed to accommodate these types of signatures? Paragraph 3.73**

Yes, smart contracts using DLT can utilise eIDAS compliant advanced electronic signatures and qualified electronic signatures.

In principle, a token-based DLT digital signature is capable of being eIDAS-compliant. The Law Commission highlights the possibility of multiple users bearing rights to digitally signing a blockchain transaction, which can occur by way of a multi-signature wallet.

21. **Are you aware of any cases in which parties have arranged for the terms of a deed to be performed by, or recorded in, computer code deployed on a distributed ledger? Paragraph 3.79**

We are not aware of any UK-specific projects. Whilst we expect deeds to be capable of being digitally signed and witnessed and either stored or executed on a DLT system, the burden is largely on individuals to engage legal advisors to prepare accompanying legal advice to ensure a natively digital deed is legally valid because the area is so new and untested in courts. This is a costly exercise and a repetitive one for individuals to bear giving rise to the need for government and regulators to issue clear guidance. In the alternative, individuals are deploying smart contracts with the intention that they operate as deeds or wills but which may not stand up as legally valid or pass probate processes.

In Australia, the *Electronic Conveyancing National Law* (ECNL), which has been adopted by all major Australian jurisdictions, allows for land registry instruments such as mortgages (which are deeds in most Australian jurisdictions) to be digitally signed on an approved Electronic Lodgement Network Operator (e.g. PEXA or Sympli).

A template smart contract is available at ethereum.org which is intended to store digital asset wealth until the digital asset owner passes. The temporary COVID measures to allow electronic execution of Wills, some measures of which have been made permanent, have assisted with adding natural language text to the smart contract to ensure it is a legally valid Will or part of a Will. However, the smart contract functions need to be set so as not to transfer digital assets to the specified beneficiaries until
after probate is granted notwithstanding that the digital assets could be transferred shortly after a person dies. Due to the novel nature of such an arrangement, it is not clear how quickly a smart contract could be granted probate which veils the arrangement with uncertainty despite it being a clear mechanism for the storage and disposition of digital asset wealth.

22. Do you consider that a deed recorded partly or wholly in code can satisfy the statutory formality requirements applicable to deeds and address the implications of the Mercury decision? Paragraph 3.80

In short, yes. We also note that due to the COVID pandemic, a number of electronic signing and witnessing laws and regulations arose in Australia, including in respect of deeds. It may be worth looking into the guidance issued by Australian Law Societies (e.g. Law Institute of Victoria and the Law Society of New South Wales) on how witnessing and other formalities can be satisfied in a digital environment. At the time of submission, some temporary laws in Australia have lapsed whereas others have been made permanent and it remains to be seen how law makers will address this issue going forward.

In particular, we note that if parties sign digitally an appropriately worded smart contract (i.e. including the words “signed, sealed and delivered”), the signatures will be date-stamped, which is particularly relevant for highlighting whether the witness signed before or after the other signatories.

In relation to digital signature, and in particular, digital witnessing, it is interesting to consider whether a machine can functionally supply acceptable equivalent of witnessing. Namely, can the objective of witnessing be achieved through digital means by verifying: identity, intention to sign, act showing intention, link between the person and the act, link between the person and the document and that the process has not been tampered with. It is arguable that an appropriate digital platform, software and necessary safeguards and processes in place, digital witnessing may provide a better outcome of the witnessing goals than the current manual, or hybrid virtual/manual processes in place.
23. Are you aware of, or do you foresee, any difficulties in applying the principles of interpretation to identify whether terms of a particular smart contract are contained in the natural language component or the coded component of the smart contract, or both? Paragraph 4.10

A preferred approach would be that the parties have expressly stated in the contract whether the terms of a contract are to be contained in the natural language or coded component, and made a choice as to which is to be preferred in the case of conflict or overlap.

In particular it is our view that commercial norms are likely to emerge whereby 'boilerplate' clauses included in the contract indicate the primacy of the natural language component. This is particularly important in circumstances where an error in the coded component can have immediate unintended impacts to the parties. Current principles of interpretation are such that the courts "do not easily accept that people have made linguistic mistakes, particularly in formal documents". This approach has developed in circumstances where contracts are entirely comprised of natural language, and is not necessarily fit for purpose for code language which – due to its very precision – can often contain unintended mistakes if only detected upon execution. Testing for bugs and unintended mistakes should become mandatory before a smart contract is deployed and signed.

24. In what circumstances might disputes arise about the proper interpretation of the coded terms of a smart contract? Please provide examples where possible. Paragraph 4.15

The interpretation of what was objectively intended by coded components (where such components are considered to contain a term of a contract) will be a more difficult exercise for the courts, likely requiring expert evidence, given comparative lack of expertise in interpreting coded languages as compared to legal or natural languages. The circumstances could be wide-ranging, particularly when the contract or agreement does not include a list of definitions or agreed natural language terms dealing with the peculiarities introduced by coded components, including for example: how the contract should deal with code, privacy and data related issues, the legal status of the code and hierarchy as between the terms, which may be a mix of code and natural language.

Unlike natural language components, which require humans to interpret and give action to performance, coded components are directly interpreted and performed by machine systems. The nature of disputes which arise from interpretation of coded terms of a smart contract are therefore likely to have to deal with an additional dimension – which is that neither party is necessarily responsible for a flawed

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interpretation and/or performance of a term in quite the same way as they might be for a natural language term. This is why clear risk allocation terms are advisable, particularly as between the parties and any third parties (particularly those involved in enabling the coded components or digital hosting and actions of the contract).

Key examples of circumstances likely to give rise to disputes include:

- Inconsistencies between natural language and coded components, particularly where both deal with the same, or part of the same, term or contractual process;

- Issues flowing from the limitations of programming languages – including identifying the ‘natural meaning’ of words expressed in code, as well as discerning the intention of the parties;

- risk of mismatch or mistake in translation between natural language and code;

- risk of incorrect input or output data triggering performance or a change in legal status, for example where a legal right to a transaction is lost due to an automation failing to pick up when an exchange rate has reached a certain limit;

- risk of mistaken execution – an issue for many types of smart contracts will be where the off-ledger status of the agreement does not match or align with the on-ledger status. For example, in relation to insolvency, given the escrow arrangements for payments executed by smart contract. Discrepancies between on-ledger and off-ledger execution status can create insolvency issues. That is, there is a question of whether mistaken payments (due, for example, to an outdated assessment of available funds) constituting an insolvent transaction will have implications for priorities, given the smart contract holds nominal funds (representing a future obligation to pay the final amount) in escrow pending settlement. This will particularly be the case for “physical” agreements where execution relies on physical acts to update the on-ledger status, for example, a supply contract, where the status of delivered goods may not be up to date due to human or technical error, or simply time lapses between updates. In these circumstances, it may be questionable whether the smart contract is the source of truth for execution status in the event of a dispute.

25. **Do you consider that the meaning of a coded term of a smart contract would or should be determined by asking what the term would mean to a: (1) reasonable person; (2) reasonable person with knowledge of the relevant code; or (3) functioning computer?**

**Paragraph 4.30**

As an overarching principle, the same considerations as those which apply for the interpretation of any part of a legally binding agreement should continue to apply, from a complex commercial transaction to a purchase of real estate through to the simple acceptance of a delivery parcel.
In practice, this is likely to depend on the nature of the particular contract, and in particular the impact of any natural language terms which govern or are intended to give meaning to coded components. A contract where it is found that the objective intention of the parties is that the natural language components are to be given primacy over the coded components will likely rely more heavily on (1) (what the term would mean to a reasonable person), whereas a contract that is wholly in code, or does not expressly or implicitly consider the interactions between code and natural language will likely require a combination approach.

A reasonable person without a coding background should not be relied upon to interpret or understand a coded term without assistance.

So the approach of option (2) (a reasonable person with knowledge of the relevant code) is preferable, though still lacking. If a coded term is considered a contract term, then normal rules of construction should apply – including normal use of allowable evidence. The class of reasonable person should not be restricted as Option 2 presents. It is not required that the reasonable person understand source code, but they must have that code’s meaning or explanation conveyed to them. The test could instead provide subjectivity in the form of a reasonable person with the knowledge and expertise to be able to enter into a contract that includes coded terms. The court may be required to translate source code into natural language prior to applying this test. This translation could be completed by an expert or assessor, appointed by the parties jointly or separately or by the court. This reflects the process currently undertaken for foreign language contracts.

26. **Do you consider that performance of the coded terms of a smart contract cannot always be predicted based on a reading of the code? If so, can you provide examples or specific evidence of this occurring?** Paragraph 4.31

Much depends on the nature of the coded term; in particular the degree of connectivity, and variability of outcomes accounted for in the code.

How many factors or variables does the code contain, and how many of these are drawn from other coded terms, other contracts, or external systems (for example data inputs or outputs from the code that trigger or otherwise impact or result from performance)? The greater the number of these types of connections and dependencies, the more difficult it is to predict the performance of a coded term. The more complex the coded terms, the more difficult they are to predict. As the smart contracting ecosystem grows in complexity so too will the algorithms and rules used to generate performance, and some are likely to incorporate machine learning and artificial intelligence-based systems. All of these factors contribute to an inability to precisely predict performance. Intersections with real-world events that frustrate, obviate or otherwise impact the intended performance of the code may also create unpredictable situations, for example where human enters data required by a coded term incorrectly, or where manual performance has already taken place, resulting in unintended redundancies.
Whether the code is performing as intended is a legal question, but appropriate boilerplate (for example setting out that natural language terms take primacy) can mitigate this risk, and allow the parties to agree that where the code does not perform as intended, more traditional performance approaches can be used by the parties to ensure proper performance is achieved. However this depends on appropriate legal drafting to achieve this effect, and each contract must be taken on its own terms until or unless principles of construction are developed.

27. **What practical or procedural steps could the courts take to resolve disputes about the interpretation of the coded terms of a smart contract? Paragraph 4.32**

See our comments regarding expert evidence above in respect of paragraph 4.30.

28. **Are parties utilising natural language in smart contracts to make their intentions clear in respect of any coded terms or the contract as a whole? Paragraph 4.37**

As detailed in ‘Smart Legal Contracts: A Model for the Integration of Machine Capabilities Into Contracts’, we consider that commercially, natural language should always be used to capture the contract as a whole, with coded terms sitting ‘underneath’ agreed terms or processes that are suitable to be automated. This does not mean that the coded components do not form part of the contract – rather, like notice provisions, they provide detailed and/or technical instructions about how performance should be conducted, which can be treated as essential or non-essential depending on the preferences of the parties.

In addition, within the limits of the law, there is much freedom for parties to determine the content and format of a contract. For example, parties may include complicated technical specifications in engineering contracts. Similarly, parties may include explanatory addendums to coded terms such as logic maps or process flowcharts to assist with setting out the agreement for how the code should work.

29. **In what (if any) circumstances should courts be able to consider evidence of the parties’ pre-contractual negotiations as an aid to interpretation of the coded terms of a smart contract? Paragraph 4.43**

This approach should be no different to the current approach as to external evidence. The critical factor is whether the parties expressly address the legal status of the code, including as compared to natural language terms with which it may overlap.

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30. **Do you consider that the courts’ current approach to contractual interpretation might cause problems in the context of smart contracts? If so: (1) Can you provide examples or specific evidence of this occurring? (2) What could be done to solve these problems?**

Paragraph 4.45

We have identified above some key issues and considerations to be dealt with, but primarily expect that existing approaches to contractual interpretation are likely to be broadly appropriate, with some adaptations on the practical level, rather than the conceptual.

One final aspect to note is that it is likely that the terms and conditions and technical specifications of any digital platform on which a smart contract is hosted or interacts is likely to impact the interpretation of a smart contract, similar to how governing law or jurisdiction may impact the interpretation of a contract currently.

As mentioned above, we are aware of one matter before an Australian court that is dealing with the issue of “code is law” versus “code of law”.
REMEDIES & SMART CONTRACTS (CHAPTER 5)

Dispute resolution and remedies for smart legal contracts

At the outset, it is important to note that there are practical issues which limit the types of contracts which are likely to be subject to disputes. For example, if counterparties are not known to each other (such as token swaps within a decentralised exchange) then there may be a complete inability to contact or locate counterparties in order to engage with a dispute resolution process. In such cases, individuals are contacting various regulators to complain about the dApp and the founding contributors involved in launching the dApp. We understand that recommended regulations covering virtual asset service providers, including dApps, will be finalised by FATF in mid-2021. It is likely that jurisdictional courts and regulators will increasingly become concerned with these types of potential disputes as clearer regulations are introduced and enforced.

This section is confined to smart legal contracts with known counterparties.

Governance of Dispute Resolution

Dispute resolution is fundamentally a question of governance in the formation stage of the contractual arrangements. That is, there is more than one approach to dispute resolution and “contracting parties must choose the most effective institutional governance mechanism to resolve their contractual disputes” that may occur in the future. A recent article published in the Harvard Negotiation Law Review proposes that there are four broad institutional possibilities in this regard:

1. Negotiation or mediation;
2. Binding private arbitration;
3. Territorial courts; and
4. Regulatory state.

Adopting this framework, it can be seen that each dispute resolution possibility has different implications for jurisdictional law.

First, there will be a limited role for courts where parties decide to informally resolve disputes and agree on their own remedies. Indeed, parties are required to attempt private dispute resolution options before turning to the courts. As such, we anticipate that minor contractual breaches are likely to be conducted in this way, as is the case currently for traditional legal contracts.

Practically, many contracts provide a safeguard by outlining the intended arrangement, over which parties are then free to adhere to or not as they see fit. For example, supply contracts may provide a deadline by which goods must be delivered. In practice, parties are unlikely to seek damages for minor breaches which do not cause loss (for example, delays of a few minutes). The automatic execution of smart contracts may have significant outcomes for such arrangements. This may also present an issue when determining whether parties have elected to waive a contractual right – in practice, acceptance of practices by conduct would not be able to be inferred where code automatically executes. Parties may be required to specifically elect to accept certain breaches (either by separate negotiation or as built into the smart contract). This may be subject to increased administrative overhead or may involve certain parties having the exposure of having payments withheld or penalties imposed for conduct which would otherwise be accepted. Such issues may need to be considered when drafting smart contracts or when selecting platforms.
Smart contracts may also present an issue of illegality, as it may allow for the enforcement of contracts which would otherwise be void. To a lesser extent, smart contracts may also allow for the continued operation of contracts which are not compliant with their legal obligations to include certain terms (for example, consumer protections, residential tenancy terms and employment protections). This risk is present in natural language contracts – however, parties may have less recourse in circumstances where the contract automatically executes. For example, when a retail client of a bank receives notification that they may be subject to penalty payments for late loan repayments, there is a clear opportunity to challenge the conclusion. This may not be true if the money is automatically deducted via the operation of a smart contract (particularly if it was issued in “standard form” by a party with increased negotiating power, without consequences being properly understood). Restrictions on the use of smart contracts in fields prone to such issues or increased regulatory supervision may assist in mitigating these risks.

Second, there will be an enforcement role for courts where parties have agreed to binding private arbitration. This agreement could be made during the smart legal contract formation or after a dispute has arisen. The form of arbitration could occur on-chain (i.e., through a blockchain-based dispute resolution plugin) or off-chain (i.e. through a commercial arbitrator, ideally with knowledge of smart legal contracts). The role for the courts here is to enforce the decision of the arbitrator.

Third, there will be a significant role for courts if one party commences litigation and a court is given carriage of the matter. A preliminary question here will be how jurisdiction is determined. Parties can provide greater certainty to this question by explicitly stating the governing laws and jurisdiction during the contractual formation stage. However, a court will still require jurisdiction to entertain the case. The common law doctrine of forum (non) conveniens may provide some guidance in this regard. Justifiability would be assisted by a clear legislative mandate providing a particular court with jurisdiction over smart legal contract matters.

Fourth, regulation could mandate that an existing administrative body (e.g. an ombudsman) could mandate one type of dispute resolution mechanism. The role of courts here will be to apply existing administrative law principles to reviewing these decisions.

The traditional legal system will need to understand these above dispute resolution possibilities (including blockchain-based dispute resolution systems) and how they interact with the jurisdictional court system.

**Enabling Enforcement**

There are circumstances where a Court is likely to have to interpret smart contracts, even where dispute resolution clauses may be present – for example, the validity of the dispute resolution clause may be challenged or where the code of a contract is considered to form part of the terms and/or may be a factor in the interpretation of the natural language terms. As such, the Court would need to be able to interpret coded sections of smart contracts and the operation of ADR methods.

In general, experts may be retained by the parties to provide such a background to the Court. While the use of experts has long been effective in allowing Courts to adjudicate complex concepts, smart contracts may be even more complex for the following reasons:

- most judicial officers are unlikely to have an understanding of the concept of smart contracts or their technical operation;
- conflicting experts may be difficult to reconcile in the absence of such knowledge; and
- there is an absence of precedent in the field.
In particular, there may be circumstances where the Court must determine more than what the code actually accomplished (which is a factual inquiry that experts may be able to assist with) but what the parties intended for the code to accomplish. This is a legal conclusion which may require a solid conceptual understanding of the technical operation of the smart contract. This may be achieved through the use of experts who are able to interpret and communicate the conceptual and practical objects of the code, which can then be interpreted by a reasonable person. For the reasons outlined above, parties may consider that judicial interpretation may present the risk of providing an unpredictable outcome as to the operation of the contract. These reasons are also why parties may choose to voluntarily engage an arbitrator with these expert skills and rely on courts to enforce an arbitrator’s findings if required.

The likely response of parties may be to prepare either natural language contract terms which are intended to entirely govern any coded components is affected by code, to create an entirely natural language contract, with coded implementation treated as separate to the contract, or to provide a form of explanatory aide in the course of negotiations. Laws governing the use of smart contracts may benefit from specifying what material may be admissible in this interpretation exercise (if any). Training of judicial officers may also be of great assistance in applying these principles.

Where no dispute resolution clause exists, the traditional legal system will need to establish and interpret the terms of smart legal contracts and whether existing legal principles can be imposed on smart contracts. There is a high degree of uncertainty and this may provide grounds for legislative intervention.

Remedies

There are a range of remedies that could be imposed following a dispute resolution process. There is a distinction between remedies “on-chain” (where parties have coded into the smart legal contract ‘remedies’ or specified actions arising in response to specified events or triggers) and “off-chain” (where parties agree, or a binding determination or court order requires, a party to do a particular thing to remedy the breach).

First, at the interlocutory stage, a form of ‘suspension’ or ‘pausing’ of the automatic operation of the contract may assist. For negotiation, mediation and arbitration - parties may agree on this process upfront. Indeed, it is a feature of some blockchain-based dispute resolution mechanisms. For judicial or administrative intervention, this would require that parties are technically able to do this when ordered to do so. Alternatively, courts or regulators would require some ‘gateway’ into the smart legal contracting infrastructure that may not be desirable from a public policy perspective. Such ‘suspension’ or ‘pausing’ orders could be made permanent.

Second, contractual damages could be awarded where loss and damage are appropriately made out. A future issue to consider in this regard is whether courts can award damages denominated in cryptocurrencies or structure remedies around other forms of digital assets. It is likely that there will need to be a legislative basis for doing so.

Third, specific performance could be ordered where damages would not be an adequate remedy and it was determined that the parties intended a particular outcome that the smart legal contract code did not achieve. Again, the availability of this remedy would depend on the technical capabilities of the relevant DLT system or platform, and the ability of Courts to enforce this by locating the relevant parties or platform administrators.

Fourth, smart legal contracts could be ordered to terminate. Here, we consider that parties are likely to consider a method of rescission or termination of code during the formation of the
contract. The ease with which a party may terminate code, or the availability of a ‘self-destruct’ function is likely a commercial decision of which party bears the risk of the contract ending or continuing to function. These methods of termination may operate in a manner consistent with established contractual terms, but must also be able to be accommodated by the chosen DLT system or platform.

For example, one such system may be:

- one party may issue a notice of termination due to a breach occurring;
- if the notice is not contested within a reasonable time (as defined by the contract or code), the smart contract may be terminated by mutual consent; and
- if the termination is contested, this may progress to ADR or judicial determination.

However, we note that the structures required in order to enforce such forms of termination would reduce the benefits of smart contracts as an impartial, reliable form of executing contractual operations.

31. Are you aware of, or do you foresee, any practical difficulties in ordering rectification of the coded terms of a smart contract? If so, do you think that parties to a smart contract will, in practice, seek rectification? Paragraph 5.26

On rectification, we do not foresee such difficulties in ordering rectification of terms if parties use a bespoke and well-designed smart contract platform with natural language capability. The parties may then set out how the contract is rectified, within the terms of the contract itself. Natural language capability combined with code would allow the parties to pre-agree how automated systems might respond where acts of reversal are required.

Although the database on which a contact is stored is immutable, it is possible to add new metadata that replaces the old metadata so it is possible to rectify or amend contracts, even those that have been signed. Because all changes are tracked, it is trivial to determine if a contract has been altered after signing and by whom. This leaves open the existing mechanisms for enforcing a bargain – such as litigation, where the court of competent jurisdiction is able to order the legal or natural persons with whom the contract is entered into to abide by the order of the court, with the corresponding sanctions for failure to comply. There are practical difficulties in adopting the same approach in permissionless systems.

We are aware of one matter currently before an Australian court that is dealing with the issue of “code is law” versus “code of law” in relation to the ETH – ETC Hard Fork. In short, the hard fork of the Ethereum blockchain instituted the remedy of rectification (for ETH holders that suffered loss as a result of the DAO attack) but did not need a court to order the remedy of rectification because the act of hard forking achieved this remedy.

32. Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether the parties have made a common mistake when entering into a smart contract? Paragraph 5.41

See response to Question 31.
33. What steps or precautions (if any) do parties typically take before entering into a smart contract to satisfy themselves that the code will execute as intended? Paragraph 5.42

See response to Question 31.

34. Do you consider that the legal principles concerning unilateral mistake might need to be adapted to accommodate smart contracts concluded by computer programs without human intervention? In particular: (1) is it appropriate to confine a unilateral mistake to a mistake about a term of the contract? (2) what test should the court apply in determining whether the non-mistaken party had knowledge of the mistaken party’s mistake? Paragraph 5.56

See response to Question 31.

35. Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether a smart contract has been entered into as a result of a misrepresentation? Paragraph 5.62

The difficulties will relate to who is making the representations and whether a reasonable person would believe they had sufficient authority to make representations that would be relied upon. Such difficulties will soon be made apparent when enforcement actions are likely commenced against DeFi protocols. Social media posts by founding contributors to a protocol as well as interested community members could constitute representations and misrepresentations that are relied on by retail investors and traders, particularly in relation to the security and resilience of a protocol, and some social media accounts are pseudonymous.

See response to Question 31.

36. Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning rescission to smart contracts which have been vitiated for misrepresentation, duress or undue influence? Paragraph 5.79

At a high level, smart contracts are self-executing and they self-execute quickly. Legal processes are far too slow to keep pace which begs the need for proactive involvement by regulators in releasing smart contract templates (even if this exercise begins with consumer facing standard contracts). If the law were needed to rescind a smart contract, all of the token transactions had and received by the smart contract would increase the difficulty of properly rescinding the smart contract.

See response to Question 31.
37. Are you aware of, or do you foresee, any difficulties in awarding damages for breach of contract where the terms of a natural language contract are performed automatically by computer code? Paragraph 5.91

If breach of contract is reasonably foreseeable, one party could require the counterparty to deposit funds in escrow to automatically meet payment of damages for breach of contract. Where breach of contract is not reasonably foreseeable, the parties should negotiate and agree parameters for the return or splitting of benefits enjoyed as well as the allocation of liability for damages depending on the nature of loss suffered and by whom.

See response to Question 31.

38. Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning termination where the terms of a natural language contract are performed automatically by computer code? Paragraph 5.95

See response to Question 31.

39. Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning breach of contract to contracts recorded wholly or partly in computer code? Paragraph 5.104

See response to Question 31.

40. Are you aware of, or do you foresee, any difficulties in applying the law on frustration to smart contracts? Paragraph 5.112

See response to Question 31.

41. Can you provide examples of terms that parties have included (or might include) in the natural language element of the smart contract to address the risk that subsequent events might affect the performance of the code? Please explain: (1) the drafting of the provision; (2) the subsequent events covered by the provision; (3) the effect, under the provision, of the subsequent event on the contract; and (4) the remedies available to the parties under the provision. Paragraph 5.113

In relation to open source protocols that can be copied and amended (i.e. Hard Forks), public representations and disclaimers are recommended to guide users as to which chain should be considered the original versus the new. This is one of the issues before an Australian court in relation to the ETH – ETC Hard Fork. Absent clear
representations, it is left to the court to interpret the facts and circumstances available, which also requires experts, which is a lengthy and expensive process.

See response to Question 31.

42. Are you aware of, or do you foresee, any difficulties in applying the illegality doctrine to claims made in relation to smart contracts? Paragraph 5.117

See response to Question 31.
CONSUMERS & SMART CONTRACTS (CHAPTER 6)

43. Are you aware of any business to consumer smart contracts currently in use or in development? Please give details. Paragraph 6.5

We are aware of a number of pilot programs and proof of concepts for the use of smart contracts in a consumer setting, particularly in the insurance and consumer credit space. However, very few of these pass the initial set-up stage, with one exception NFTs that is looked at last. Please note that some of these use cases (except as where expressly referenced as legally binding) would generally fall into the self-executing code on a blockchain category of smart contract.

(a)  Banking and securities

Lygon is a blockchain-based platform for the digitalisation of bank guarantees involving a joint venture between a number of Australian banks along with IBM and retail operator Scentre Group.\(^{25}\) The platform underwent a live pilot in July/August 2019 and Lygon as a joint venture was formally announced in February 2021.\(^{26}\) Lygon enables applicants, issuers and beneficiaries to obtain legally binding guarantees in a single day.

Iberpay, the manager of the Spanish interbank payments infrastructure, is also developing digital bank guarantees.\(^{27}\) Banco Sabadell, Banco Santander, Bankia, BBVA and Caizabank completed a proof of concept smart contract for managing bank guarantees in July 2020. The group is focused on broader applications for the automatic execution of payments triggered by smart contracts in blockchain networks.

(b)  Insurance-related products

As mentioned in the call for evidence AXA launched its flight delay smart contract platform ‘Fizzy’ in September 2017.\(^{28}\) The product was based on the Ethereum blockchain and allowed customers to receive automatic compensation for flight delays via a self-executing insurance policy. The smart contract integrated with global air traffic databases such that payment would be automatically triggered if a delay of more than 2 hrs occurred. AXA scrapped the product in October 2020 due to a lack of uptake. It cited a lack of distribution channels as one of the contributing factors.

\(^{25}\) https://www.lygon.io/

\(^{26}\) AFR ‘Scentre, ANZ create first digital bank guarantee with Lygon blockchain’ (9 February 2021)

\(^{27}\) Finextra ‘Spanish banks complete tests of programmable payments for smart contracts’ (15 July 2020)

\(^{28}\) Axa ‘Axa goes blockchain with fizz’ (13 September 2017)
A similar decentralised insurance application Etherisc Flight Delay also uses smart contracts to provide consumers with insurance against flight delays and cancellations.\(^{29}\)

In 2017, B3i (the Blockchain Insurance Industry Initiative) created a proof of concept for a smart contract built and agreed on blockchain technology called **B3i Resinurance** or B3i Re.\(^{30}\) This was the first application built on top of the B3i Fluidity platform. By February 2020, nine insurers, four major brokerage firms and eight reinsurers had concluded 30 reinsurance contracts using the product. Future versions are planned for March 2021 and September 2021 to introduce claims management features and extend to additional reinsurance types and lines of business.

(c) Healthcare

In the medical industry, smart contracts are being used by **Encrypgen**\(^{31}\) to transfer patients' DNA data to researchers for clinical trial purposes.\(^{32}\) Encrypgen went live in November 2018\(^{33}\) with ‘Gene-Chain’, a genomic blockchain marketplace that enables individuals to sell access to their health data and DNA directly to researchers. The blockchain application aims to ensure patients remain in control of their genomic data, while allowing researchers to engage in research to progress treatments and cures for diseases. Researchers that want to use your data have to request, or in some cases even pay for the privilege.

See also the Australian Commonwealth Government’s “My Health Record Integration” project.

(d) Residential real estate

**Propy** is a silicon valley based tech company. Its core product is a residential real estate transaction platform, powered by smart contracts.\(^{34}\) Once a buyer makes payment to the seller, a smart contract automatically changes ownership of the asset based on the payment information on the blockchain. Propy enabled the world’s first property transaction using smart contracts in 2017. While it currently mirrors official land registry records, its mission is to encourage jurisdictions to adopt Propy as their official ledger of record such that a transfer of property over the Propy platform constitutes a legal transfer of the property and the legal registration of that transfer.

**Land titles Australia** - nearly all examples at present however are pilots. See details at paragraph 3.66 regarding the NSW Government’s digital Torrens Title replacing all paper certificates of title.

\(^{29}\) https://fdd.etherisc.com/#/

\(^{30}\) B3i media release ‘**Major reinsurers and brokers complete complex placements on B3is Blockchain Platform**’ (12 February 2020)

\(^{31}\) https://encrypgen.com/

\(^{32}\) Encrypgen blog post ‘**Mid-year update, June 2020**’ (June 2020)

\(^{33}\) The Scientist, ‘**First Blockchain-based Genomic Data Marketplace Launches**’ (November 2018)

\(^{34}\) https://propy.com/
(e) Other products

Other examples include:

- **YouPic**, a decentralised photography platform for photographers. Photographers can securely register and license their images using smart contracts. Photographers received payments through the platform from customers directly, avoiding the need for brokers and their commissions.

- **Drife**, a ridesharing app operating in Bangalore. It uses a series of personalised smart contracts between drivers and riders, where drivers stake Drife’s DRF token to be chosen for rides. Instead of paying a fee for every fare, drivers pay an annual fee to use the app.

- **S7 Airlines**, a Russian-based airline runs a private blockchain to issue and sell tickets using smart contracts. The airline sold the first air ticket in the world that was bought by connecting to a banking system through a blockchain in July 2017.

(f) NFTs

Businesses are increasingly using NFTs, which use smart contracts, as are artists and celebrities. NFTs are not new, but until recently they were largely confined to crypto enthusiasts. Examples include:

- **NBA Top Shot** - people are purchasing short videos of digital moments of NBA games through their credit cards, they are a digital equivalent of basketball cards.

- **Taco Bell** has sold NFTs in a promotion.

- **Charmin**, US based toilet paper manufacturer has sold NFTs

44. When would you estimate that smart contracts might be in common use in business to consumer contracts? Paragraph 6.6

Business to consumer (B2C) contracts are often distinguished from business to business (B2B) contracts on the basis of the different degrees of assumed knowledge that are attributed to contracting parties. Analysis of B2B contracts is typically predicated on the basis that there are at least two equally sophisticated parties with professional knowledge that each understand the terms of the bargain that they have struck while B2C contracts assume an imbalance in bargaining power and knowledge. There is generally no presumption that the lay consumer has read, nor understood the terms of the contract which are assumed to have been set by the company. In most

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35 [https://youpic.com/blockchain](https://youpic.com/blockchain)
36 YouPic blog post ‘The future of Photography is already here-The YouPic Blockchain’ (25 September 2018)
37 [https://drifie.io/#/](https://drifie.io/#/)
38 S7 Airlines ‘The amount of operations via the S7 Airlines blockchain platform and Alfa-Bank exceeded $1 million in July’ (30 July 2019)
39 [https://www.nbatopshot.com/](https://www.nbatopshot.com/)
developed legal systems around the world various protections are enshrined into law to seek to address the perceived inequities of B2C contracts, England and Wales being no different. The Consumer Rights Act 2015 for example seeks to grant consumers certain minimum requirements of transparency and fairness as well as right and remedies which counterparts are unable to contract out of. B2C contracts that do not comply with these obligations can be deemed unenforceable and constitute a breach of consumer protection regulations.

For there to be widespread use of B2C smart contracts certain market conditions must be met, such that the benefits of using smart contracts in the B2C setting outweigh its risks. The DLA proposes the following minimum threshold requirements be satisfied before widespread adoption of smart contracts is likely to take place:

(a) **Sufficient time and cost savings**

Business stand to benefit from huge efficiencies, both in terms of time and cost, in the adoption of self-enforcing smart contracts in B2C transactions. The greatest efficiencies are likely to apply to large-scale, standard form terms and conditions for which businesses currently spend vast amounts of time and effort in developing, drafting, and enforcing. However, not all provisions of legal contracts are suitable candidates for being expressed in machine-readable form. Current legal parlance relies heavily on ambiguous and abstract concepts such as ‘reasonableness’ and ‘good faith’ which do not find a functional equivalence in code. Over time contracting practices are likely to shift towards more binary yes/no contractual provisions with less reliance on ‘lazy’ or ambiguous legal language. Businesses are likely to see significantly more benefits from using entirely automated end to end smart contracts compared to the automation of one or two provisions, or the value realised from structured data created through smart contracts. While there are still substantial efficiencies to be gained from simple self-executing performance provisions alongside a more traditional legal contract, unless there is a real saving of cost and time then B2C contracts are unlikely to garner the necessary investment that will see them adopted in various sectors.

However, we note that certain of our members are already advising individuals in relation to their interactions with DeFi to use digital assets as collateral to borrow funds to purchase real estate and for small to medium business financing.

(b) **Certainty of enforcement**

As discussed in Q45 and Q46, there are a number of challenges exemplified in the context of B2C smart legal contracts including obligations of transparency, enforcement of rights e.g. minimum warranty protection. B2C transactions are unlikely to be implemented as smart legal contract until businesses are satisfied that compliance with consumer protections is indeed possible and that there is sufficient consistency in the regulation of smart B2C contracts across multiple jurisdictions. We know that globalisation is a continuing trend and many businesses prefer to adopt standard terms with minimal variation between jurisdictions. Smart contracts also rely on distributed ledger technology that may not reside in a single jurisdiction, rather to exist across multiple locations.
Different regulatory bodies in different jurisdictions are currently at various points in their lifecycle of research, interpretation and support of smart contracts. The Law Commission is certainly at the forefront of such research and is to be commended for this. However, it is surely the case that widespread adoption of smart contracts will be supressed until businesses can be reassured that their business terms for particular consumer products do not require vastly different approaches, systems, coding rules and other features in order for such contracts to be enforced in each of their core markets.

(c) **Access to reliable data**

Smart contracts rely on a variety of data feeds to trigger certain events or transactions.\(^{42}\) Traditional contracts by contrast rely on the sharing of information as between parties or perhaps interconnected systems. Typically a human is required to ensure that information is shared with another party, an assessment is required to validate the information and ensure it complies with the terms of the contract, before the relevant action can be progressed. Smart contracts for B2C transactions are therefore likely to grow in popularity alongside the growing banks of trusted data relating to the relevant action. Access to such data is more widespread in some sectors than others e.g. financial markets have seen significant progress in the adoption of public data sets through initiatives such as open banking. Another challenge mentioned by commentators is the challenge of time in the context of changing data sources.\(^{43}\) Simple point in time B2C transactions such as making a food purchase are less likely to need to deal with this additional layer of complexity, but for more complex B2B and B2C arrangements close monitoring of the data source, its validation and mechanisms for making suitable adjustments will be required to be developed. Until such a time, it is likely that the adoption of smart contracts in B2C transactions will be limited to simple, standardised use cases involving point in time purchases.

(d) **Improved co-operation and standardisation of smart contract development**

At present, smart contracts tend to be carefully created to address single, bespoke use-cases. While there are a smattering of proof of concepts for B2C smart contracts, it is clear that there is currently no general consensus or standard that can be shared. Although the DLA is aware of organisations such as the Accord Project who are focused on developing an ecosystem and open source tools to develop smart legal contracts. Given developers are generally tasked with creating smart contracts from scratch, presumably based on existing legal contracts, it is likely that there is substantial duplication of effort, not insignificant mistakes and a great deal of testing before running in a live application. Until standards are developed and businesses do not need to re-


\(^{43}\) Ibid
solve similar problems every time it seeks to prepare a new smart contract it is likely that take up of B2C, and in fact all smart contracts will be limited.

A significant limiting actor on B2C smart contracts is the fact that it is difficult to achieve scalability of the technology and energy production with current market solutions.

45. **What challenges do you foresee in applying consumer protection laws to consumer contracts entered into wholly or partly in code? Are there any additional existing protections, beyond those we have discussed, which you think are or will be particularly important in the smart contract context?** Paragraph 6.39

The DLA's discussion for question 44 applies to this question.

The following expands on the discussion of standards in question 44 (improved cooperation and standardisation of smart contract development), and businesses should not be required to resolve similar problems every time it seeks to prepare a new smart contract. There is an opportunity for smart contracts (and thus contractual terms) to be valid and not breach the law, which is not always the case with wet contracts. For example, in the New Zealand context, two studies have shown the high prevalence of unfair contract terms in New Zealand online contracts. Every contract analysed in two studies contained unfair contract terms. Legislation banning unfair contract terms in consumer contracts, however, is relatively new in New Zealand and the rate in which such terms occur in contracts are likely to be lower than in the UK. By “approved for use”, a body such as the Competition and Markets Authority (CMA) could take the responsibility of vetting smart contracts. While this would add to the CMA’s workload initially, after a library of smart contracts had been created the work would reduce and would greatly increase consumer protection in the UK. One limitation is that consumers purchasing goods or services from organisations based outside the UK would not be as well protected; however, those consumers are not well protected in the UK with wet contracts.

46. **What, if any, additional protections do you think are required for consumers entering into smart contracts? In particular, do you consider that there is a case for an explicit legal requirement that terms of a consumer contract which are fully or partly in code must be explained in natural language before the conclusion of the contract?** Paragraph 6.40

Yes, there should be an explicit legal requirement that terms of a consumer contract which are fully or partly in code must be explained in natural language to the

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consumer. That explanation must be given early in the process. It is too late for someone to be given the opportunity to view (and save/print) after a person has begun entering in their details. For example, the explanation could be made available alongside an image or description of the service or good.

**Intellectual Property – Royalty Distribution**

This is not a specific question, but the DLA has some additional information to add about the use of smart contracts in royalty distribution in addition to Ujo music.

The use of blockchain, and therefore smart contracts, to assist musicians including with recovering royalty payments, has been discussed for a number of years, with a number of projects trialling blockchain. More recent blockchain projects for royalty distribution include:

- **Blokur** uses a blockchain to streamline the collection of royalties. Blokur has recently been announced as an approved partner of the Mechanical Licencing Collective (MLC)’s Data Quality Initiative. The MLC is responsible for administering the compulsory licences for the use of musical works on streaming services in the United States. Blokur also allows users to request a license directly from publishers. Blokur first began on the Ethereum blockchain, but it is not clear if it is still using Ethereum.

- **Smart contracts for Creative Interactions** – a project funded by Innovate UK under the Collaborative Research & Development programme, aims to facilitate low friction interactions between creators of music and their customers to unlock new value in the creative ecosystem by using blockchain.

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46 [https://blokur.com/](https://blokur.com/)


JURISDICTION & SMART CONTRACTS (CHAPTER 7)

47. Are you aware of, or do you foresee, any difficulties in identifying the place of formation of a smart contract? Paragraph 7.27

We do not foresee difficulties beyond those identified in the Call for Evidence for the reasons set out below.

In relation to determining jurisdiction of smart contracts, the location of formation of a contract provides a way to determine applicable law. However, consideration should be given to connecting factors affecting the contract in deciding jurisdiction.49

When it comes to smart contracts, the question of where the smart contract was made is complicated by possibility of cross-border parties (particularly digital nomads) initiating smart contracts entirely online and hence, no obvious state or country of contracting. This is further complicated by the distributed nature of the underlying technology.

The place of formation of a contract is important as it is one of the key factors to consider when determining of relevant jurisdiction.50 Marshall in reconsidering the principles of contract law refers to this as the ‘country’ formulation of a contract.51 In this case he considers that the place of contracting and place of performance carry a great weight in determining applicability of jurisdiction and hence the law.52

Traditionally, various courts have considered the place of contracting by its physical attributes. For example, McCafferty gives insight to how the Federal Circuit Courts determine enforceability in cases of contracts. One of the factors the courts look at is the place of contracting, especially with regards to a physical location.53 In the case of James Miller & Partners Ltd v Whitworth Street Estates (Manchester) Ltd, the court considered the place of contracting as the physical location of where the contract was made. In that case it was Scotland.54

This idea of place of contract as a physical space raises difficulties in nominating the internet as a place of contracting for smart contracts. Similar challenges arise with smart contracts being created by distributed ledger systems, as all information is decentralised across multiple nodes which may or may not reside in a given jurisdiction. The nodes control information flow and therefore pinpointing a “server” location is difficult. The other option then is to ask whether the platform of agreement can be deemed a place of contracting. This can be a website hosting the transaction or

49 Anne McCafferty (n1) 95.
52 Ibid.
53 Ibid 96.
54 James Miller & Partners Ltd v Whitworth Street Estates (Manchester) Ltd (1969) 1 WLR 377 CA.
even a signature verification app. As a platform, the eco-system exists within its terms and condition and arguably the law of its relevant jurisdiction (if and only if one is readily and exclusively identifiable).

Despite these challenges both courts and economists\textsuperscript{55} have noted that the place of contracting is not a definitive approach to jurisdiction. There are other factors that must be taken into consideration. McCafferty identifies the place of contracting as part of a larger group of considerations in determining choice of law. Article 3 of the Rome Convention and the question of place of contracting, scholars such as Brigg have shown that the country formulation is not preferred when compared to the use of the system of law formulation.\textsuperscript{56} The latter formulation considers connecting factors rather than intention of parties in contracting when looking at the application of law. The distinction was brought out in the case of \textit{Rossano v Manufacturers' Life Insurance Company}, where the court upheld that the connecting factors to Ontario law provided for choice of law to be asserted there rather than in Egypt, where the parties contracted.\textsuperscript{57}

48. \textbf{In what circumstances do you think that jurisdiction to hear a dispute in relation to a smart contract could be based on the actions and location of an agent? Paragraph 7.30}

We do not consider that computer programs that have reached agreement autonomously should be considered ‘agents’ of the parties for the purposes of the rules on jurisdiction. We agree with the view expressed in the call for evidence.

49. \textbf{Do you think that a rejection of state law in favour of the rules contained in the platform’s protocol is or should be a choice that can be given effect to under article 3(1) of the Rome I Regulation? Paragraph 7.42}

Parties’ freedom to contract should provide the opportunity to adopt a platform’s rules and protocol that can be incorporated into the terms of the contract to govern the agreement between the parties, but as a matter of public policy, platforms should be governed by state law.

We agree with the view expressed in the Call for Evidence that a choice of platform rules would not be a choice of law that could be given effect to under article 3(1) of the Rome I Regulation (in its current form). We do not see merit in legislative proposal to allow a choice of a non-national system of law due to broader public policy implications.


\textsuperscript{56} Adrian Briggs, \textit{Agreements on Jurisdiction and Choice of Law} (Oxford University Press, 2008) 435.

\textsuperscript{57} \textit{Rossano v Manufacturers Life Insurance Co} (1963) [1963] 2 QB 352.
Parties have freedom to contract and choose the terms of their contract. The *locus classicus* is the case of *Printing and Numerical Registering company v Sampson*.\(^{58}\) In the case, George Jessel MR set out the principles of freedom to contract. He stated that as a matter of public policy, a person of full age and competent understanding shall have the utmost liberty of contract. He stated that this agreement to contract under their own terms must be held sacred and shall be enforced by the courts of Justice. This doctrine has been debated in courts over various contractual terms. For example, the concept of caveat emptor exhibits the range of freedom parties have to contract in a given matter in terms of risks taken to contract between parties.

This doctrine permeates into the question of choice of law. The Rome I Regulation allows for parties to determine what law would apply. Under Article 3(1), parties must expressly demonstrate the choice of law. The parties can agree to a choice of law being applicable partly or wholly. We note that the Rome I Regulation does not state what type or which law is applicable. A literal meaning afforded to the convention would point us to consider all types of laws. Taken from this standpoint, the law as per Black’s Law Dictionary, means a rule or method according to which actions coexist or follow each other. This could place sharia law, community-based law and in this case, computer code protocols under the definition of valid law.

However, the purposive approach to the Rome I Regulation extends to looking at the applicable law as state law. Martina Mantovani, in her presentation on conflict of laws in contractual and non-contractual matters recognizes that the law chosen by the parties to a contract must be state law.\(^{59}\) She notes that the Regulation itself can not recognize anything else as formal law. Turning to recital 13 of the Regulation, we note the Regulation implies that parties cannot rely on non-state laws to govern, but rather they can incorporate them as terms of a contract. This means that the non-state laws can be relied on in the contract but do not govern the contract. The result is that parties cannot rely on computer code as a basis of governing law.

We can also draw comparison to common law principles such as from the guiding notes to the submission provided for the case of *Shamil Bank of Bahrain V Beximco*.\(^{60}\) The question was whether the court could consider Sharia law as a permissible law in the law of contracts. The appeal was dismissed on the basis that sharia law was not a state-based law. It was not a law that was recognised in the United Kingdom. Therefore, U.K contracts law would apply in the matter. Sharia law is a non-state law that the courts could not apply. This is an important case since it provides a possible line of comparison when it comes to smart contract protocols as law.

From the case, we see Morison J firmly present a case in which non-state laws can exist in the same forum as state laws. In paragraph 54 of the decision his honour notes that the use if Sharia law was used as a tool to trump English law and exclude the courts.\(^{61}\) The law, based on not state action, was not in any way capable of being

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\(^{58}\) *Printing and Numerical Registering Co v Sampson* (1875) (1875) LR 19 Eq 462.


\(^{60}\) Shamil Bank of Bahrain v Beximco Pharmaceuticals Ltd [2004] 1 W.L.R. 1784.

\(^{61}\) Ibid[54].
enforced despite connection to England and performance carried out in England. His honour pointed out that common law has provided a stable form of law under which contractual liability can be resolved. Under the scope of the decision and ratio, smart contract protocols can also be subject to subjective change at any point. Smart contract code and protocols may not set out in a formal document, differ from one transaction to another and cannot be pinpointed to a specific source of enforceability. This renders the code ineffective to be relied on as law or a source of law.

50. **Can an express choice of applicable law be embodied in computer code?** If possible, please provide any practical examples of a coded clause expressing a choice of applicable law. Paragraph 7.45

We assume it is technically possible but the real question is what would the purpose and value be of embodying express choice of applicable law in code. In a future state where laws of an applicable jurisdiction are also expressed as code, there would be obvious benefits to having the contract digitally connected to applicable laws of the jurisdiction.

It may also be beneficial for commercial businesses with significant number of contracts in multiple jurisdictions to be able to interrogate their portfolio of contracts to identify choice of law elections under their contracts. In this instance the code may not need to be shared operative code between counterparties to the smart contract, but rather code attached to the contract for contract management purposes.

For legal certainty however, we recommend that natural language provisions be included to make this express election, for certainty and to avoid any possible error or malfunction in the coded nomination.

51. **What factors are capable of connecting a smart contract to a particular jurisdiction, for the purposes of article 4(3) and 4(4) of the Rome I Regulation?** Paragraph 7.59

Despite the additional issues with selection of jurisdiction for smart contracts discussed in question 41, in many respects the identifying factors that are capable of connecting smart contracts to particular jurisdictions will be similar in principle to traditional contracts.

The jurisdiction of the smart contracting platform may be a relevant factor in the connection of smart contracts, and in particular where parties chose to run a smart contract on a platform and the platform rules influence the parties’ express election of governing law of the jurisdiction of the platform.

52. **Are you aware of, or do you foresee, any difficulties in the context of smart contracts in applying the choice of law rules that apply under the Rome I Regulation to contracts of carriage (article 5), consumer contracts (article 6), insurance contracts (article 7) and individual employment contracts (article 8)?** Paragraph 7.61
Contracts of carriage (article 5)

The conceptual issue brought about by discrepancies between off-ledger ("physical") and on-ledger status of the contract provides difficulty in application of this provision. This causes difficulties in reconciling concepts such as the "habitual residence of the carrier" for the purposes of determining applicable law. However the concept of "place of delivery" should not prove difficult, given the reliance on off-ledger performance for contracts of carriage (e.g. supply contracts).

It must be noted that freedom of choice under article 3 is retained, for the parties to nominate the law of the country where:

a) the passenger has his habitual residence; or
b) the carrier has his habitual residence; or
c) the carrier has his place of central administration; or
d) the place of departure is situated; or
e) the place of destination is situated.

This remains consistent with current thoughts on best-practice for smart contracts, which would be to include a natural language governing law clause (as a boilerplate or non-functional not, for example).

Consumer contracts (article 6)

The same conceptual issue regarding "habitual residence" of the consumer will apply as that in contracts of carriage of goods. The question then is whether the self-executing nature of smart contracts create counterparty risk, given consumer contracts may be standard-form. Given Article 3 provides for freedom of choice of law, in some cases a seller may want discretion over whether or not to sell into a particular jurisdictions due to unfavourable governing law in the jurisdiction of the consumer. This may need to be built into the agreement through form of logic statement excluding sale to consumers from certain jurisdictions.

53. **Do you think that a rule of jurisdiction based on the place of contractual performance can be applied where the performance takes place on a distributed ledger? Paragraph 7.72**

We agree with the Call for Evidence in that place of performance can be determined traditionally were automation under a smart contact results in real world events.

For example, if a smart contract is meant to carry out the fulfilment of delivery of commodities, the place of performance doctrine would be effectively used based on the physical place of performance, namely the consignee’s address. However, in cases where the results of the smart contract are within the distributed ledger system, then there is difficulty in placing jurisdiction by place of performance. This is more so with regards to services rendered totally on DLT. For example, purchase of crypto art or NFTs. The ownership of crypto art exists in the DLT together with the art itself. The
art is not physically delivered to the buyer, only access to view the art digitally (unless
delivery is construed as the delivery of data that can be visually interpreted).

Jurisdiction based on place of performance is a test used under the Brussels 1
Regulation to provide a context on how choice of law and conflict of law questions can
be resolved. Article 5(1)(b) of the Brussels Regulation states that in the absence of an
agreement to the contrary, the place of performance is the place where, under the
contract, the goods or services were delivered or should have been delivered. This
approach is what could be termed as a “cause-and-effect” mechanism in contracting.
Jurisdiction by place of performance looks at where the effect of the contract took
place. Therefore, when we turn to issues such as smart contracts, if we want to apply
the same standard, we should ask whether the effects are ones that provide for
delivery of goods or services in a physical place other than the distributed ledger
system.

Faye Fangfei, looks at this question in depth where she considers how courts should
determine jurisdiction based on place of performance. She states that when it comes
to digital contracts, especially concerning goods, the place of performance is where
delivery of the products takes place, and the same with services.\textsuperscript{62} The difficulty comes
in where there are many places where performance takes place. She takes the view
held in \textit{Drack Gmbh V Lex International Veriend Gmbh}, where the court stated that
when looking into provision of goods over the internet, in particular contracts
performed in various places, the defendant must be ready to be sued in any place that
has the closest connection with performance of the contract. Therefore, when applying
this to the situation of smart contracts the question becomes, where are the resultant
goods delivered or services performed. If there are multiple places of performance
then the precedent above would satisfy the question of jurisdiction.

Faye also considers the question on fully digitized products that have no tangibility.\textsuperscript{63}
This presents a more difficult question to answer. In her reasoning, she raises this
aspect as a non-conclusive argument, where there is no definite answer on
performance. She states that the place of download cannot be fully considered the
place of performance. The location of the receiving server could be a possibility of
place of performance. Nonetheless, the reasoning brings about a more complicated
scenario when we consider distributed ledger systems and the general effect of the
architecture of a decentralized ledger system. The challenge is that fragments of a
digital product within the distributed ledger cannot definitively identify the place of
performance. Similar reasoning could be applied to smart contracts.

Therefore using place of performance in respect of fully digital products of smart
contracts is problematic. The best alternative is to consider jurisdiction based on more
connecting factors other than place of performance.

\textsuperscript{62} Faye Fangfei, “Obstacles And Solutions To Internet Jurisdiction A Comparative Analysis Of The EU And US

\textsuperscript{63} Ibid.
54. **What factors do you think are capable of connecting a claim in relation to a smart contract to a particular jurisdiction?** Para 7.85

In the recent UK case *Ion Science Ltd v Persons Unknown*, the High Court decided that the *lex situs* of a token is the place where the person or company who owned the coin or token is domiciled. This approach disregards the distributed nature of DLT, and imposes a legal reality to resolve a dispute in the UK jurisdiction. This may be problematic for contracts between multi-signatories, autonomous or anonymous parties to a contract.

As with many of our answers, if parties are able to use a properly developed smart contract platform with a well thought through set of features, such as those outlined in DIIP 2021, this will override any particular jurisdictional issues as it will allow – belt and brace style for the familiar set of boilerplate clauses that normally handle these things, to continue to do so, for example, to make adjudications about jurisdiction, by the natural language inclusion of a jurisdiction clause, where this will work together (rather than detract) with the platform to also enact any attached automations.

55. **Which, if any, rules for establishing jurisdiction do you consider will be most problematic in the smart contracts context? Do you agree with our analysis of the issues as described in this call for evidence?** Paragraph 7.86

We agree with the analysis of the issues as described in the Call for Evidence.
FINAL QUESTIONS (CHAPTER 8)

56. Are there any issues we should be considering on smart contracts beyond those we discuss and ask about in this call for evidence?
Paragraph 8.3

Utility of smart contracts in facilitating IP transactions

The following response is a good example of a problem, a new type of transaction attempting to solve it, but the solution falling short when using a public, permissionless DLT solution that fails to allow for good natural language drafting to solve for the complexity that a logic based approach alone will not currently solve. A properly developed smart contract platform should be able to help get the benefit of the automation as well as the natural language. In its absence, relying on public platforms, we are unable to facilitate certain IP transactions and end up with some of the concerns set out below.

One of the most frequently cited concerns in the music industry is the vast sums of revenue that never reach the artist. Such complaints have become even more widespread with the growth of music streaming services. There are a number of factors contributing to this problem – the divisibility of copyright such that rights holders can transfer one or more of the exclusive rights in a copyright work to different persons, the lack of centrally available databases of ownership information, and the proliferation of intermediaries including publishers, record companies, content distribution platforms and financial payment processors who all take a clip of royalty payments that may be due to the artist. All of this culminates in a complex and opaque web of licensing agreements that neither benefits rights holders nor users.

Smart contracts represent a promising tool for facilitating the transfer of rights in copyright protected works such as music, video, software, photos directly between IP right holders and users.

Rights holders may be able to publish IP assets on a DLT, thus creating a quasi-immutable record of ownership. Smart contracts can be used to automate who has access to the relevant assets, and self-enforce any limitations of use built into the code by the rights holder.

- Royalty payments can be coded in based on various algorithms e.g. adjustments to suit current market demand (demanding a higher price and thus maximising

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revenues) or lower prices when demand drops. Fees may also be differentiated based on commercial and non-commercial use.\textsuperscript{67}

- Smart contracts running on DLT can provide additional transparency across which various stakeholders in a transaction can agree on, and automatically provide for, the transfer of funds to authorised parties in return for the granted rights in the relevant asset. This ensures a quick and direct payment of the relevant royalty to the person or persons who are entitled to receive royalty payments.

- Reliance on intermediaries is reduced such that payment times are significantly decreased and sent directly to the intended recipient.

Organisations such as Ujo music\textsuperscript{68} and (although no longer operational useful as an illustrative example, JAAK\textsuperscript{69}) were developing decentralised databases which rely on smart contracts to automate royalty payments. Although JAAK's 'KORD' blockchain network was initially piloted as a music-as-a-platform marketplace to buy and sell rights in music, its hope was to create a single database of royalty and IPR ownership information across a range of intellectual property rights and industries.\textsuperscript{70} The promise of smart contract based management of copyright and other IP assets may further be bolstered by the use of non-fungible tokens (NFTs) that can act as unique certificates of ownership for any assigned digital assets. NFTs can be resold, distributed and licensed in accordance with the built-in restrictions coded into the NFT by the owner.

However, there are a significant number of unresolved issues which limit the applicability of smart contracts to IP transactions. Bodo, Gervais and Quintais for example have identified difficulties in mapping smart contracts to specific, individual uses of IP assets.\textsuperscript{71}

- The regulation and enforcement of licensed use of on-chain vs off-chain IP assets is fraught with difficulty e.g. copyright is subject to a range of important exceptions which seek to appropriately balance the rights of authors and those of users. Smart contracts, which operate on ‘if-then’ rules are likely to face difficulties in assessing whether various off-chain uses are covered by exceptions or limitations. Pech has identified the potential for rights holders to ‘over licence’ where users may be required to enter into licences, when in fact no licence is required for a certain use at law.\textsuperscript{72}

- Another crucial issue to resolve is how to address jurisdictional conflicts as between the copyright laws that exists in different territories, in particular different


\textsuperscript{68} https://ujomusic.com/

\textsuperscript{69} https://jaak.io/


\textsuperscript{72} S Pech ‘Copyright Unchained: How Blockchain Technology can Change the Administration and Distribution of Copyright Protected Works’ (2020) 18(1) Northwestern Journal of Technology and Intellectual Property 1-50, 45.
rules around exhaustion of rights. While copyright is one of the more standardised areas of intellectual property protection and several international treaties on copyright and related rights exist – it is still the case that there is considerable variation in exceptions to copyright, terms and in fact the exclusive rights that attach to copyright works, particularly in the digital arena.\textsuperscript{73}

The fact that cryptocurrencies are considered necessary for payments to occur via smart contracts is also a limiting factor in the adoption of smart contracts for royalty payments. The purchase of cryptocurrencies remains relatively complex – whether artists seek to create their own or use existing currencies such as Bitcoin or Ether, the process for purchasing cryptocurrency is not well known and can take considerable time and effort (one of the very reasons that platforms such as Spotify were set up for music distribution).\textsuperscript{74}

There are many open questions and challenges to the adoption of smart contracts in the field of IP licensing, notwithstanding general challenges of smart contracts particularly around technical restrictions and scalability. However, if industry and legislators can work together to overcome these problems, smart contracts could conceivably help to alleviate some of the challenges to traditional models of content distribution that exist in the digital sphere.

Assumptions underpinning the Call for Evidence

At the Hult International Business School students are taught to embrace traditional technology architecture including standards (as discussed in this document) but to see this as a commodity within the overall business ontology of the given solution. This ontology includes financial and other value based currencies and capital (financial, natural, human etc) that can be captured, tokenised and utilised. Top down legal (law) and bottom-up grass roots informal garments (lore) as well as expertise in relationship (interconnectedness between people, things, systems and AI) need to be considered.

57. Which other jurisdictions should we look to for their approach to smart contracts, and why? Paragraph 8.4

There may be merit in the Commission considering the following jurisdictions to the extent the Commission hasn’t done so already:

\textsuperscript{73} E.g. In New Zealand copyright generally lasts for the life of the author plus fifty years, whereas in many other jurisdictions including Australian and the United States the general position in life of the author plus seventy years.

a) Australia in relation to the Australian Governments projects including Health Records (see Para 3.66) and Digital Law Technologies prototype.

b) The USA in relation to eChecks (see para 3.66).

c) Singapore generally in relation to a progressive jurisdiction that has actively taken steps to encourage digital transformation across key industries.

d) New Zealand in relation to progressive approach to rules as code for legislation.

58. **Are there any legal reforms that you consider immediately necessary to remove uncertainty and unlock some of the potential benefits and cost savings of smart contracts? Paragraph 8.5**

Yes. Support for a well-designed smart contract platform that is DIIP 2021 compliant (including support for the protocol, or something similar) will remove considerable barriers (risks) to the profession and business in adopting digital contracting with efficiency gaining automations and new structured data sets with less uncertainty. The average analogue contract has a nine per cent leakage of value, as a whole of UK economy consideration, this is substantial. This is before we even consider how we can use legal instruments and digital policy documents to better support compliance. We as a profession should lead the charge on making what we do more efficient – our legal duties in fact require it.

Legal reforms may also be required to encourage government funding to ensure platforms/infrastructure and applications developed to support any aspect of the law (disputes, legislation, contracting) take a long view to the future of the profession. This includes the impact of data collection and AI on citizen’s privacy, certainty and access when approaching the law. These are core legal ideals that must be safely transported to the digital domain. There is some evidence that relying solely on commercial motivations to drive digital infrastructure and applications will not be sufficient to ensure a safe and easy transition to digital smart legal contracts. There is also some evidence that relying on the current solutions developed in pursuit of solely commercial or crypto/commercial drivers will not lead to the low energy platforms required to help combat climate change.

The Digital Law Association commends the Law Commission on its work in relation to smart contracts and would welcome the opportunity to discuss any of these matters further.
Chapter 2: What is a smart contract?

Question 1

Please share your views below:

In our experience, the most commonly automated contractual obligations are varying forms of simplified sale/purchase agreements relating to digital assets. We are also aware of smart contracts relating to insurance contracts, financial instruments, real estate and other physical assets such as fine art.

Question 2

Please share your views below:

We are of the view that the Law Commission's scope on smart contracts for the purposes of this consultation should be limited to contracts which use distributed ledger technology only. Other 'smart' and 'automated' contracts do exist and are widely used within the profession which for example auto populate answers but in our view that would not be correct focus as we understand purpose of the Law Commission's call to evidence is to consider the legal queries and implications of DLT based smart contracts which may be prominent in the financial technology industry but has limited examination in the courts.

Question 3

Please share your views below:

The choice to elect between permissioned or permissionless DLT systems is dependent upon the parties intentions, however, in our experience there are limited use cases for truly permissionless system at this stage. A permissionless system raises important legal queries including but not limited to how to effectively carry out and meet KYC/AML requirements, sanctions queries in particular with respect to payment of “gas” fees, questions with respect to liability and so on. In our experience, and in particular with respect to large corporate and financial institutions where DLT use is considered, a permissioned (or private) system will be elected for certainty.
Question 4

Hybrid contract

Please provide examples of how these forms of smart contract have been used in practice:

Question 5

Please share your views below:

Question 6

Please share your views below:

We agree the principal and most prevalent current use of concepts for smart contracts are broadly outlined in paragraphs 2.43-2.63 of the Call for Evidence.

Question 7

Please share your views below:

We agree the principal benefits and costs savings as outlined in paragraph 2.65 of the Call for Evidence and would expand on 'enforcement costs' to specify general disputes costs as significant savings assuming the conditions are met and parameters are correct implemented.

Chapter 3: Formation of smart contracts

Question 9

Please share your views below:

Question 10

Please share your views below:

Question 11

Please share your views below:

We refer to the UK Jurisdiction Taskforce Legal Statement on Cryptoassets and Smart Contracts (UKJT Legal Statement). As outlined in the UKJT the ordinary rules of contract law should, in principal, apply to smart contracts. Smart contracts should in principle be capable of giving rise to binding legal obligations with the general considerations to be taken into account - namely, was there offer and acceptance of sufficiently certain terms; did the parties to the smart contract intend to create a legally binding relationship; is the requirement for consideration satisfied? Depending upon the nature of the contract, answering these questions might require an analysis of the contract’s source code.

In terms of contractual interpretation where a smart contract is written wholly or in part in code, we expect the meaning of a smart contract will be what is expressed in the code. Code language, generally speaking, is capable of being clear and unambiguous. Where it is not clear, the Courts can seek to determine the objective intention of the parties, including whether the code was intended to define the obligations of the parties or merely to implement them.

We refer to the Call for Evidence and commentary in UKJT re anonymity. A smart contract be a valid contract notwithstanding that the parties to it are anonymised. In this respect we look at signature by private key which would in principal likely to satisfy statutory signature requirements (as can other forms of electronic signature, provided the intention was to authenticate the document); and a smart contract can, in principle, fulfill a statutory requirement for a contract to be ‘in writing’, even if in code, provided it can be read.

We would consider the decision of the Singapore Court of Appeal in Quoine Pte Ltd v B2C2 Ltd4, in which it was decided that automated contracts for trades on a trading platform give rise to legally enforceable contractual rights and obligations, to be instructive and worth consideration.

Question 12

Please share your views below:

N/A

Question 13

Please share your views below:

Please see answer to question 11 above re the application of private keys where parties identities are unknown.
Chapter 4: Interpretation of smart contracts

Question 23

We refer in the first instance to the principles of contractual interpretation summarised at paragraphs 4.3 to 4.5 of the Call for Evidence. Furthermore, we refer to the three forms of smart contract identified at paragraph 4.6 of the Call for Evidence based on the role played by code in a contract: (i) natural language contracts with automated performance; (ii) hybrid contracts; and (iii) solely coded contracts.

For both natural language contracts with automated performance and solely coded contracts, there is unlikely to be any difficulty in identifying where the terms of a particular smart contract are contained, principally because the terms will be – by definition – contained solely within either the natural language or coded components (respectively). For these two categories, the relevant consideration is therefore whether the smart contract in question is in fact a natural language contract with automated performance, or a solely coded contract, or is instead a hybrid contract (in which case, difficulties are more likely to arise).

With respect to contracts that contain an "entire agreement" provision stating that each term of the smart contract will be set out in natural language, no difficulties would arise in determining that it is a natural language contract with an automated element, rather than a hybrid contract. Similarly, no difficulties would arise in determining what type of contract is being dealt with in a scenario where there is only code to consider (for example, where an individual interacts only with a "DeFi" (decentralised finance) smart contract hosted by a "DAO" (decentralised autonomous organisation).

This leaves a limited set of smart contracts where difficulties could arise in practice, i.e. natural language contracts with automated performance but without "entire agreement" provisions, and hybrid contracts. For such contracts, assuming there is no provision within the "interpretation" section providing which part of the contract takes precedence, it may be more difficult for a court to identify the location of the exact terms and/or whether the natural language aspect or the coded aspect takes precedence in the case of a conflict. That said, the established principles of interpretation are likely to enable the English Court to interrogate smart contracts to identify the relevant terms in the majority of circumstances, principally because the established approach has been developed to be flexible enough to allow the Court to interpret agreements and their terms in a very broad range of circumstances.

We do not, therefore, anticipate material difficulties in the majority of cases in applying the principles of interpretation to identify whether terms of a particular smart contract are contained in the natural language or coded component of a smart contract. That said, it might be difficult to interpret coded provisions once they have been identified, as explained below.
We agree that the three situations identified at paragraph 4.13 of the Call for Evidence may give rise to disputes about the proper interpretation of the coded terms of a smart contract.

In particular, we consider that such disputes are more likely to arise in situations whether one or both of the parties was not involved in the coding of the smart contract, for example because one party takes sole responsibility for the coding or because it is outsourced to a third party. In these circumstances, parties may not fully evaluate the coded terms of the contract, leading to disputes at a later stage.

Further, as an additional circumstance, we consider that disputes may arise about the interpretation of the coded terms of a smart contract in situations where the meaning of the coded terms will impact on whether there is in fact a legally binding contract at all.

Question 25

Please share your views below:

We consider that, on balance, the meaning of a coded term of a smart contract should be determined by asking what the term would mean to a reasonable person with knowledge of the relevant code. We do not consider that this would be a material divergence from the current principles of interpretation, since courts already have mechanisms in place to allow them to deal with, for example, foreign language terms.

We consider it would be less useful to determine the meaning of a coded term by reference to either a reasonable person with no knowledge of the relevant code or a functioning computer:

- In relation to interpretation by a reasonable person, this is principally because, as noted in the Call for Evidence, a person unfamiliar with the language of code is very unlikely to be able to interpret it. The Court is therefore likely to interpret the provision in light of what a reasonable person with knowledge of the relevant code would view it as meaning in any event, and by accepting that is the relevant test at the outset, the Court gives itself more discretion to be guided by expert evidence (which is likely to be necessary and appropriate in circumstances where it is possible, if not likely, that the relevant judge lacks a working knowledge of coding).

- With respect to a functioning computer, while code is – by its very nature – unambiguous from a computer's perspective, it will not always accurately reflect the parties' intentions (for example, the code may be inadequate to meet the parties' intentions, or the execution of code may be affected by inaccurate input, a platform system failure or interference by malware). Since wider context is a relevant consideration under established principles of interpretation, it would not be appropriate to discount context from the interpretation of coded terms, and interpretation by a reasonable person with knowledge of the relevant code would allow context to remain a relevant factor. Moreover, it is unclear how a human judge could interpret the relevant code with the mindset of a functioning computer, other than simply to conclude that the code must have operated as intended as that is how the relevant system on which the code is operated put it into effect, which would effectively mean issues of interpretation would only arise where the question in issue is whether the system responsible for putting the code into effect had malfunctioned (i.e. the question would be "did the system malfunction, and if so, what would the system have done if it had been functioning properly?").

Question 26

Please share your views below:

12. There are steps that could be taken both to prepare in advance for the increase in disputes involving smart contracts that seems likely to come and to implement in the lifecycle of such cases when they do arise. We consider the following may be useful:

- Provide training to selected members of the judiciary in coding and smart contracting. This will be needed, in the context of interpretation, to ensure that the court can give technical and scientific words their technical and scientific meaning. Such training could be rolled out generally across members of the judiciary likely to be involved in such cases and/or organised by parties to disputes on a case by case basis.

- It is likely to be beneficial to have a pool of judges familiar with these issues and who have sat on cases dealing with smart contracts, to whom new cases involving smart contracts can be allocated, to leverage their expertise. Depending upon the number of disputes involving smart contracts, a specific court or list within the Business and Property Court designated to deal with all such disputes may be useful.

- Taking this further, there also needs to be a pool of expertise in coding available to provide parties with expert advisors / witnesses in relation to coding issues. This body of experts is likely to grow organically as more disputes require such expertise, but could be further promoted through courses geared to provide training and recognised accreditation for experts in this area.

Question 28

Please share your views below:

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an agreement cannot otherwise sensibly be interpreted even in light of assistance from appropriate experts. In such circumstances, having regard to the precontractual negotiations may assist in providing certainty of outcome, rather than undermining it (noted in Chartbrook as being a key concern in admitting such evidence).

On a separate but related point, where smart contracts are ostensibly self-executed and are written solely in code, there might be an argument in certain cases that the actual contract is not the code at all, but rather an oral or informal one created at some point during the negotiations between the parties (assuming negotiations took place) and that the code is simply a mechanism for carrying out that agreement. In such circumstances, the party making such an argument would need to rely on the parties' negotiations, not to interpret the terms of the contract, but rather to evidence them.

**Question 30**

Please share your views below:

15. Whilst we do not have any examples or specific evidence of any such problems, in terms of resolving these problems the instinct of English lawyers and courts will be to seek to apply the common law in the first instance, with new legislation only being necessary if, as things develop, it becomes clear that there are gaps in the common law that prove impossible to close in practice. With this in mind, training and development of a deeper understanding of distributed ledger technology and computer programming within the judiciary (as well as amongst solicitors and barristers) will be crucial to:

- ensure the judiciary sufficiently understands this new technology to enable them to apply the existing common law principles; and
- identify areas in which the existing principles are impossible to apply so that appropriate legislation can quickly be formulated to plug any gaps.

Tied to this is the external pool of specialists which needs to be encouraged to grow so that parties to smart contracts can rely on external expertise to assist in contractual interpretation and to provide accurate and reliable expert evidence to assist the courts where necessary.

**Chapter 5: Remedies and smart contracts**

**Question 31**

Please share your views below:

**Question 32**

Please share your views below:

**Question 33**

Please share your views below:

**Question 34**

Please share your views below:

We have considered this question in the context of (1) what mischief the principle of unilateral mistake is intended to protect against; and (2) whether there are other remedies available to the injured party, which they can rely upon to provide redress in situations which would otherwise be manifestly unjust.

Addressing the first part, to succeed on a claim for unilateral mistake, the claiming party must show that (1) the claiming party made an error in the written terms of the contract; and (2) the counter-party knew of the error but proceeded to execute the contract anyway, without drawing the error to the claiming party's attention, as the error was to their benefit. Actual knowledge and exploitation of an error is accordingly a determining factor in the application of the unilateral mistake remedy. A mere unilateral mistake on the part of one party, which is unknown to the other, does not engage the doctrine.

As the case of Quoine, referred to in the consultation paper demonstrates, it may be difficult for the "innocent" party to prove that the benefitting party had the requisite state of mind to engage the doctrine in circumstances where contracts are executed by computer programmes. A different test, namely whether a reasonable person in the benefitting party's position with knowledge of the circumstances surrounding the transactions would have concluded that the transactions were the result of a fundamental computer error, may have given a different result (albeit by definition that state of knowledge would only have arisen in the mind of a human actor after the transactions took place digitally).

As set out in the consultation paper, under English law, unilateral mistake is a common law doctrine, and the mistake must be about the terms of the contract. However, if the overarching intention of the doctrine of unilateral mistake is to protect against one party taking advantage of a mistake which he/she knows the other party to have made, it may be appropriate to extend the protection provided by the doctrine to other errors. Included could (and/or should) be manifest errors that would be obvious to a reasonable person with knowledge of the transactions but where the reason such knowledge does not arise at the time of contracting is because the contract is made between programmes. For example, in the case of contracts executed by algorithms, it might be in the interests of justice in particular cases to provide redress where there is a mistake as to the effect of a term, rather than as to the term itself.

On the other hand, this perhaps does not sit comfortably with the principle that the Court should not rescue a party from a mere "bad bargain".

In seeking to address this issue, however, appropriate consideration will need to be had as to whether it is necessary to expand the scope of the doctrine of mistake, or whether the objective could (and/or should) be achieved by other means. In this regard, it would be relevant to look at other remedies available to parties for the same circumstances.

Under the current test, to establish unilateral mistake the claiming party must prove that the other contracting party had actual awareness of the claiming party's mistake at the time when the contract was signed. What "actual awareness" consists of is a matter of interpretation but goes above mere suspicion of a mistake.
Whether this test is appropriate in the case of a given smart contract will depend upon the facts in question. However, given the likely minimal interaction between the human agents of the parties to a smart contract, and the potential speed of execution of the various transactions, the likelihood of being able to establish “actual knowledge” of a mistake may be limited (certainly before or at the time the relevant codes interact and the mistake becomes manifest).

It may, accordingly, be appropriate to widen the test for knowledge for certain types of smart contracts to that which the other contracting party reasonably ought to have known, or knowledge of circumstances which would (1) indicate the facts to an honest and reasonable person; or (2) put an honest and reasonable person on inquiry. By way of example, where a party speculatively writes a piece of “predatory” code, in order to take advantage of how another party’s code might operate, such speculative “sharp practice” of the party, whilst not amounting to actual knowledge of an error, could be sufficient for the Courts to consider that the doctrine of unilateral mistake should apply.

Moreover, for certain other smart contracts, it may be necessary to have some backward-operating test of knowledge, as it might be difficult or impossible for either party to know how the relevant codes are going to interact until they do so. In other words, there might be no actual knowledge of the mistake at the time a contract is formed by two pieces of code, but by evaluating how the codes have interacted, retrospectively becomes clear that there was a mistake as to effect. Again, there is a balancing act between a “fair” outcome and going so far as to rescue a party from what is just a bad bargain.

Question 35

Please share your views below:

We agree with the analysis at paragraph 5.61 of the Call for Evidence, that the existing law could be applied without too much difficulty to determine whether there has been an actionable misrepresentation.

If established, the remedies available for misrepresentation are rescission of the contract and / or damages, depending upon whether the misrepresentation was fraudulent, negligent or innocent. However, as dealt with below, whether the relevant remedy can be applied in practice might depend upon the type of smart contract in question.

Question 36

Please share your views below:

If a contract is rescinded, it is set aside from the start and the parties are restored to the position they were in before the contract was made.

However, one of the features of distributed ledger technology is its immutability which “ensures that data, once recorded on the ledger, is very difficult to amend.” We therefore agree with the Call for Evidence that, in certain circumstances rescission in the traditional sense might not be possible.

We agree with the proposed suggestions of other ways the court could achieve “practical justice” between the parties set out at paragraph 5.76 of the Call for Evidence. As noted in the Call for Evidence, a “one size fits all” approach is unlikely to be possible and the approach taken would vary on a case by case basis (albeit a body of case law will build up over time, providing guidance on the approach the court may take in certain scenarios).

Question 37

Please share your views below:

The principle remedy available for breach of contract is an award of damages, the purpose of which is compensatory (i.e. to put the innocent party in the same position as if the contract had been properly performed – Robinson v Harman (1848 1 Ex 850)).

Save in circumstances where the relevant liability has been excluded (and that exclusion is deemed to be enforceable as a matter of law), an innocent party may be able to claim damages by reference to the natural language portion of the contract by proving that the code operated in a way inconsistent with the natural language (i.e. in circumstances where the natural language portion takes priority over the code). We agree with the Call to Evidence that there appears no logical reason to excuse a party for its breach of contract, simply because the action or inaction that comprised the breach arose from code rather than the actions of a natural person.

On a separate but related point, damages may be sufficient for the innocent party when the obligations are of the variety explained at paragraphs 5.86 to 5.87 of the Call for Evidence (i.e. a one-off performance). However, if on-going performance is a contractual feature (i.e. the computer code continues to perform in a way which is contrary to the parties’ intentions outlined in the natural language contract) then other remedies may be required in order to put a stop to the continuing breach, particularly where damages are not an adequate remedy.

Question 38

Please share your views below:

A contract may be terminated under (a) its express or implied terms; or (b) the common law right to accept a repudiation. If a contract is terminated, it does not cease to exist. Rather, the parties are excused from performance of their future rights and obligations.

Notwithstanding that a natural language contract (the performance of which is automated by code) could as a matter of law be terminated for breach, we agree that difficulties might arise where a portion of the contract is comprised of self-executing code. The solution proposed in the Call for Evidence, of fitting such contracts with a “kill” or “self-destruct” mechanism (provided for in the natural language contract) is an inventive one. However, on the other hand, providing the parties with a means of automatically terminating the coded element of the contract might itself be open to abuse, for example if a party “kills” the contract to avoid the execution of trades on unfavourable terms (i.e. in circumstances whether such party deems it more advantageous to breach the contract by “killing it”
than honouring its obligation, even though such a breach might result in a claim against it).

Question 39

Please share your views below:

We agree that the issue identified at paragraph 5.99 of the Call for Evidence could pose a significant problem, i.e. that on one view it is difficult to see how the coded element of a contract could be said to have caused a breach of the coded provisions, since by definition the code should operate as programmed (unless the breach were caused by a technical malfunction, such as a code not executing a transaction in circumstances where it was programmed to do so). We agree with the view at paragraph 5.100 of the Call for Evidence that in order to establish breach it might be necessary for a party also to succeed in a rectification argument, so as to rely on the fact that the way the code operated was not in accordance with the (rectified) terms.

Question 40

Please share your views below:

Question 41

Please share your views below:

Question 42

Please share your views below:

Chapter 6: Consumers and smart contracts

Question 43

Please share your views below:

Question 44

Please share your views below:

Question 45

Please share your views below:

Question 46

Please share your views below:

Chapter 7: Jurisdiction and smart contracts

Question 47

Please share your views below:

Provided that all the other pre-conditions are satisfied, under English law a contract will come into existence when an offer is accepted and that acceptance is communicated to the offeror. The general position as to communication is that an acceptance is communicated when it is received by the offeror (see, for example, Entores v Miles Far East Corp [1955] 2 QB 327). The place of formation of the contract is usually, therefore, determined by location of the offeror when he/she receives the acceptance.

We do not foresee difficulties in identifying the place of formation of a natural language contract, executed automatically by code. Problems are more likely to arise in identifying the place of formation of a smart contract which is either: (i) formed entirely of code; or (ii) formed of both code and natural language where it is unclear which part of the contract takes priority:

- Whilst the question of where the coded part of the contract is formed presents its own difficulties (see 2.2 below), there may be a conflict between the place of formation of the coded and natural language parts. Absent clear language in the natural language part as to which of the two will be taken as the place of formation of the contract, there is likely to be scope for confusion and conflict.
- As highlighted at paragraphs 7.21 to 7.23 of the Call for Evidence, there are a number of ways to determine the place where a smart contract composed purely, or partly, in code is formed, and those different approaches could produce significantly different results. This leaves open the possibility for jurisdictional challenges and parallel proceedings, as and when a party to the contract seeks to initiate a claim. One potential approach to provide certainty in such circumstances would be to provide, as a general legal principle, that the contract is formed where the offeror (who receives the acceptance from the offeree) is domiciled.

Question 48

Please share your views below:
In the context of smart contracts, we consider that there would be two potential categories of "agent" for the purposes of determining jurisdiction: (i) natural persons (e.g., a computer programmer producing coded terms for a smart contract who enters into that contract on behalf of another, as per paragraph 2.36 of the Call for Evidence); and (ii) computer programmes as a quasi-agent. Whether a candidate from within each category could be classified as an agent and be the basis for establishing jurisdiction would depend on whether they: (a) meet the conditions to be treated as an agent; and (b) could properly be classified as "in the jurisdiction".

Conditions for being classified as an agent. An agent is a person that has the power to create, change or terminate the legal relations of another (the principal). An agent can be appointed expressly (often, but not always, accompanied by a contract), impliedly (via objectively assessment of the conduct of the parties) or subsequently by ratification of actions by the principal. An agent also owes common law and equitable duties to its principal, including: to obey the lawful instructions of the principal; to act only within the limits of its authority; to use reasonable diligence and care; and fiduciary duties.

We see no reason why a natural person could not act as an agent in relation to a smart contract. In the example of the coder producing code for a smart contract and entering into the contract on behalf of another, the coder's appointment could be expressly set out in the contract with the principal or implied through a course of action. The coder could be held to the same duties as a natural person acting as an agent in a more traditional context.

The picture is more complex in relation to a computer programme. We are of the opinion that a programme could, in some respects, meet the conditions to be classified as an quasi-agent — it could be appointed expressly, impliedly or through ratification of actions by the principal. Furthermore, we consider that it would be possible to determine whether or not the programme has acted in line with its duties as an agent. Where we believe the concept falls down is in relation to remedies available to the principal against the programme for breach of its duties. The remedies available to the principal are the normal remedies available for breach of contract, notably the right to terminate for breach, and damages. The remedies available for breach of equitable duties would, again, be damages. It appears to us that a programme does not have the capability of paying damages and that the injured party would, in practice, have to seek remedies against the individual that coded the defective programme or the person that deployed it to the platform. However, the principal would still be bound by the contract, as it would have been the principal itself, acting in its own capacity, rather than the programme as quasi-agent, that would have entered into the contract.

Could the smart contract agent properly be classified as "in the jurisdiction". This question highlights some of the same issues as Question 47 – the main issue being determining the location of the agent at the point it entered into the smart contract on behalf of the principal. In relation to a natural person acting as an agent, we consider that this is unlikely to pose significant difficulties. However, if for arguments sake it was established that a computer programme could act as an agent in its own right, it would be necessary to establish that the programme was within the jurisdiction when it entered into the contract. The framing of a computer programme's "location" is complex — it could be determined by the location of the node running the computer programme, or some other place (perhaps, the location of the person that coded the agent programme or the person that deployed it to the platform). However, our view is that this issue is unlikely to arise, as a computer programme is unlikely to be treated as an agent.

Question 49

Please share your views below:

The UK's legal relationship with the EU fundamentally changed on 31 December 2020, at the end of the Brexit transition period. However, Rome I has been converted into UK law as a retained EU law, as amended by legislation. We answer this question on the basis that article 3(1) of Rome I remains in effect in the UK by virtue of being converted into UK law.

We are of the opinion that a rejection of state law in favour of the rules contained in a platform's protocol is not a choice that could, or should, be given effect to under article 3(1) of the Rome I Regulation and that a platform's protocol cannot operate as, nor replace, a choice of governing law. Moreover, in circumstances where parties do not expressly choose a governing law, a governing law would nevertheless apply, albeit it would need to be discerned using the appropriate principles of private international law. A platform's protocol can be thought of as akin to the rules of an arbitral institution: such rules may be incorporated into a contract in order to apply to the relations between the parties if a dispute arises, but do not replace the governing law of the contract. Indeed, it is essential that the parties have recourse to the appropriate national law where necessary in their dealings in order to enforce their contractual rights, even in circumstances where certain remedies are available "on chain" under the relevant smart contract itself.

Question 50

Please share your views below:

Question 51

Please share your views below:

We note the suggestion at paragraph 7.58 of the Call for Evidence that the location of the majority of mining nodes might be a relevant factor when dealing with blockchain.

Other factors potentially capable of connecting a smart contract to a jurisdiction might include:
- the domicile of the offeror (or offeree), or their agent (see the answer to question 48 above).
- where the smart contract relates to or is underpinned by real world assets, the location of those assets.
- where the smart contract requires performance of an action or actions in the "real world", where performance is to take place.
- where a smart contract is executed in the context of a permissioned distributed ledger, the domicile of the controller of the ledger (i.e. whose consent must be obtained to participate).

Question 52

Please share your views below:
Question 53

Please share your views below:

A rule of jurisdiction based on the place of contractual performance cannot easily be applied as a blanket approach where performance takes place on a distributed ledger. Such a rule assumes that the place of performance holds significance to the contract. However, where performance takes place on a distributed ledger, the place of performance may be entirely detached from the contract.

Seeking to codify what "place of performance" means in law might lead to undesirable results in certain circumstances. For example, in the case of an on-chain exchange of cryptocurrency if the place of performance is said to be the location of the payor or payee when the transfer is made (i.e. the location from which the payor or payee enters its private key to effect the transfer) such location is subject to the movements of the payor or payee. Say for example that the general rule is that contractual performance is to be the place from which the payor enters his private key to effect the transaction, such a transfer might be made by the payor in a temporary location, for example on holiday, which does not recognise the legality of smart contracts or is unequipped to deal with disputes arising from them. Equally, seeking to provide that the place of performance is where the nodes connected with the ledger are located creates considerable uncertainty if the contract is in code. In such circumstances where there are multiple nodes in different jurisdictions, the position is potentially more straightforward in the case of a permissioned ledger, as it may be appropriate to define the place of performance as the location of the network operator. However, on a permissioned system participants may be required to accept a particular jurisdiction in order to gain access to the system, so the issue is more likely to arise with respect to permissionless systems in any event.

Question 54

Please share your views below:

The factors capable of connecting a claim in relation to a smart contract to a particular jurisdiction will be largely dependent on the factual circumstances of the case, as well as the extent to which the contract is in code. One key factor might be the "place of performance", however, as discussed above in relation to question 53, this might entail significant difficulties and uncertainty.

A further potential key factor capable of connecting a claim to a particular jurisdiction is the location in which the contract was formed. Linking formation to a jurisdiction will be straightforward where the contract contains an element of natural language that expressly takes priority over the coded element. Where it is solely the act of performing the contract that is "smart", it would suggest that the parties have exchanged correspondence accepting an offer and communicating this acceptance to the offeror; in such a case, provided the essential elements to give rise to a contract have been met, the contract will be formed when, and in the location that, the acceptance of the offer is communicated to the offeror. However, the location may not be as obvious where an offeree accepts the contract offer through signing the contract with their private key. An attraction of distributed ledger technology is the ability for users to transact pseudonymously. Although users are not entirely anonymous, as they will be linked to a public address, the identity and location of the users will not be known.

The High Court, in the recent case of Ion Science Ltd v Persons Unknown, has considered that the lex situs of cryptoassets may be the place where the company or individual who owns the cryptocurrency (an initial coin offering in that case) is domiciled. This would suggest that the domicile of parties could also be a factor capable of connecting a claim relating to smart contracts to a specific jurisdiction.

The location of contractual subject matter may in some circumstances be the most appropriate connecting factor in a number of claims and yet futile in others. For example, if the smart contract is utilised with regard to transfer of title to a property, the location of such property will be an important factor in determining the jurisdiction governing related proceedings. The location of contractual subject matter may equally be applied to intangible matters where the location can be identified, such as the purchase of a domain name. Such a domain name would be registered to a particular location. However, the location of contractual subject matter may not be applied as easily where the asset is intangible and cannot easily be linked to a particular place, such as the exchange of cryptocurrencies on a permissionless basis.

Applying the contract's governing law as a connecting factor will again depend on the factual circumstances of the case. If the parties have expressed in natural language the governing law of the smart contract, this might provide an adequate connecting factor to the appropriate jurisdiction (i.e. the same jurisdiction as the governing law), albeit in circumstances where parties have selected a governing law they are also likely to have selected a jurisdiction to hear disputes. Further, in the case of a permissioned ledger there may be a requirement, on joining, to accept a specific governing law and jurisdiction (as opposed to simply accepting the rules of the ledger).

Question 55

Please share your views below:

All rules for establishing jurisdiction are likely to be problematic in certain circumstances. In the case of any contract implemented on a blockchain, difficulties will arise with regard to identification of parties and their physical location. Further, given many smart contracts will take place virtually in relation to intangible subject matter, it will be difficult to apply rules relying on place of performance or place of contractual subject matter. The call for evidence provides a thorough analysis of the rules for establishing jurisdiction and so this answer deals with the often overlooked issues surrounding express choice of law or jurisdiction by the parties.

Issues may arise even where parties have made an express choice of exclusive jurisdiction. The specified jurisdiction may not recognise the legal enforcement of smart contracts or may not have jurisdiction over the assets in play. Further, given the complexity of emerging areas of technology, the chosen jurisdiction may not have the technical understanding properly to determine a claim, particularly in cases where disputes arise following on from errors in coding. If courts are not able properly to determine claims in relation to complex technological areas, parties may be more inclined to arbitrate in order to appoint a tribunal with specialist
knowledge. Relying on a party's choice of jurisdiction, therefore, encompasses difficulties at the choice, performance, and enforcement stages.

Expressing a choice of law or jurisdiction is also arguably incompatible with the fundamentals of smart contracts. The purpose of a smart contract is to automate performance in order to eliminate the need for third party intermediaries. In the absence of natural language, a choice of governing law or jurisdiction cannot easily be written into algorithm (if at all). Further, users are attracted to distributed ledger technology due to the pseudonymity of transacting, as well as the abandonment of state rules in favour of recognition of "code as law".

The importance should also be noted of ensuring that coders, who are perhaps unlikely to be lawyers, at least in the near term, are aware of the ability to choose a governing law or place of jurisdiction and of the benefits of doing so. Where the parties do not express a choice of exclusive jurisdiction, this provides the risk of satellite litigation, particularly given that many smart contracts span numerous jurisdictions and may form just one part of a series of agreements.

The problems associated with party autonomy are important to flag in order to ensure that the legislative framework is prepared for the evolution of smart contracts. In the short term, we are likely to see contracts largely in natural language, but with an encoded element. Such contracts might be expected to contain a jurisdiction clause. However, as technology develops, smart contracts may primarily be written fully in code. Therefore, where a rule for establishing jurisdiction relies on an element of natural language, it risks stagnating technological growth or quickly becoming obsolete.

Chapter 8: Final questions

Question 56

Please share your views below:

Question 57

Please share your views below:

Other jurisdiction which should be considered with respect to their approach to smart contract are those jurisdictions which are a) driving the industry developments and b) have advanced/robust regulatory systems to fully consider the application of smart contracts with respect to legal ramifications.

Singapore

Singapore presents an attractive choice of jurisdiction in which to litigate disputes relating to smart contracts due to its established body of case law. The Singapore International Commercial Court has accepted that cryptocurrencies are legal and may be treated as intangible property. Further, the case of B2C2 Ltd v Quoine Pte Ltd [2019] SGHC(l) 3, considered the doctrine of mistake within the context of automated contracts. The Singapore Court of Appeal held that an automated programme, placing orders to buy and sell cryptocurrency without human intervention, gave rise to a legally binding agreement. In addition, in 2019 the Singapore Infocomm Media Development Authority launched a public consultation reviewing Singapore's Electronic Transactions Act aiming to provide certainty with regard to smart contracts.

United States

The United States is beginning expressly to recognise smart contracts in its legislative framework. A number of states have amended their legislation to allow for the enforceability of blockchain-based contracts. In 2017, Arizona passed legislation accepting the use of smart contracts in commerce and defining smart contracts as "an event-driven program, with state, that runs on a distributed, decentralized, shared and replicated ledger and that can take custody over and instruct transfer of assets on that ledger". Equally, in the 2019 Tennessee Code, smart contracts were defined as "an event-driven computer program, that executes on an electronic, distributed, decentralized, shared, and replicated ledger that is used to automate transactions, including, but not limited to, transactions that: (a) take custody over and instruct transfer of assets on that ledger; (b) create and distribute electronic assets; (c) synchronize information; or (d) manage identity and user access to software applications". In January 2020, Illinois passed the Blockchain Technology Act which defines a smart contract as "a contract stored as an electronic record which is verified by the use of blockchain". It is, therefore, clear that states are acknowledging the need to enshrine the definition of smart contracts into legislation and to recognise their legal enforceability. Further, broad definitions have been adopted in order to prevent regulation from becoming obsolete as technology develops. However, there is a lack of uniformity in the wording of these definitions, which presents the risk of divergence between states and jurisdictions as further legislation emerges.

Hong Kong

In contrast, Hong Kong has taken a more cautious approach with regard to smart contracts. In Hong Kong, it remains open to debate whether smart contracts can be considered as legally binding. In 2016, the Hong Kong Monetary Authority launched its research on distributed ledger technology and has published two whitepapers discussing its assessment of the use of distributed ledger technology. The second whitepaper recommends the use of an "escape hatch" which would allow contracts to be modified or undone if the contract is not executed as envisaged. The paper recommends the allowance of human intervention, subject to party approval, under strict conditions. The approach taken by Hong Kong is certainly more wary and reflects the current lack of use cases and judicial consideration of smart contracts. However, it may prove problematic as smart contracts are increasingly written fully in code.

China

China's Supreme People's Court has accepted the use of blockchain evidence and China has set up the Hangzhou Internet Court which deals with matters relating to digital commerce. The Chinese press has reported that it has already applied smart contracts with regard to online shopping and internet finance, as well as launching the use of judicial blockchain. Judicial blockchain smart contracts have the ability to utilise a smart case filing system to monitor the execution and performance of the contract and, in the event that certain conditions are met (or not met, as the case may be), such as failed performance, automatically file a claim. The Chinese Government is developing a social credit system and in enforcing such judgments, any individual or business deemed "untrustworthy" would automatically be included in the credit system blacklist and may be withheld from certain privileges. The implementation of such a system would potentially reduce costs, improve efficiency, and aid consistency of claims. However, the system may sacrifice party discretion as to whether they wish to file a claim, as well as judicial discretion with regard to enforcement. Further, in the event that contracts are required to be lodged with the court at the outset, the system may raise issues surrounding privacy, civil liberties amongst other things.
Question 58

Please share your views below::
SUBMISSION TO THE LAW COMMISSION CALL FOR EVIDENCE ON SMART CONTRACTS

Date: [Blank]

Submission Prepared By: Dr Benjamin Hayward,* Dr Lisa Spagnolo** and Dr Drossos Stamboulakis***
Monash University

By E-Mail To:
Smart Contracts Project
Att: Professor Sarah Green, Commissioner
smart-contracts@lawcommission.gov.uk

I  INTRODUCTION

The Law Commission for England and Wales (the ‘Law Commission’) opened its public call for evidence on the topic of smart contracts on 17 December 2020.1 It is with great pleasure that we offer the following evidence, addressing the United Nations Convention on Contracts for the International Sale of Goods2 (the ‘CISG’ or the ‘Convention’), in response to that call.

The desirability (or otherwise) of the United Kingdom’s (the ‘UK’s’) accession to the CISG is a matter that has been agitated in the scholarly literature for a great number of years.3 We

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note that the Smart Contracts Project’s current scoping study has been described in the ‘Smart Contracts Call for Evidence’ (the ‘Call for Evidence’) as follows:

The Ministry of Justice has now asked us to undertake a scoping study on smart contracts. The scoping study will provide an accessible account of the current law and set out how it will, or may, apply to smart contracts. It will also discuss the use of smart contracts in practice and identify any difficulties or uncertainties which arise under the law as its stands. Our project is intended to inform public debate and seek a consensus about issues to be addressed in the future. It will not offer formal recommendations for reform.5

One of this Submission’s authors has previously published research arguing in favour of the UK’s accession to the CISG.5 Nevertheless, and consistently with these instructions, this Submission takes no position on that issue. Instead, it addresses the CISG purely to the extent that it is an existing body of law, adopted by 94 current Contracting States.6

Analysis of the CISG’s application to smart contracts is still important in the context of the Smart Contracts Project, notwithstanding the fact that the UK is not yet a Contracting State.7 This is because the CISG can (and already does) govern contracts to which UK businesses are party, even without the UK being a Contracting State. Given the nature of smart contracts, and the nature of choice of law clauses, it also stands to reason that CISG’s exclusion will be less common in the smart contracts context, with the consequence that it may apply more often to smart contracts: expanding the practical impact of its otherwise-default operation. These matters are addressed, in detail, in Part III. As a consequence of these conclusions, assessing the CISG’s interface with smart contracting is a matter of significant practical importance for UK businesses. This matter is dealt with in Part II.

While the CISG’s initial applicability is logically an anterior consideration to the operation of its individual rules, our Submission addresses the questions raised in Chapter 3: Formation of Smart Contracts (in Part II) and Chapter 7: Jurisdiction and Smart Contracts (in Part III) in the order that those Chapters appear in the ‘Call for Evidence’. Concluding remarks are

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provision in Part IV. Select published research relevant to Part II and Part III’s evidence is then attached to this Submission as Appendix 1 and Appendix 2, respectively.

II CONTRACT FORMATION

Just as the CISG’s text does not directly address other post-1980 technological advances, such as commercial trade in computer software or the use of the Internet in commercial transactions, the CISG ‘does not directly address the formation of smart contracts in international trade’. The CISG does, however, address contract formation in general terms, in Part II of the Convention. Those rules can be applied to all species of contract – including smart contracts – and are helpfully summarised by Duke in a recent analysis of the CISG’s application to smart contracts. That analysis is attached to this Submission as Appendix 1.

Before considering the specifics of the CISG’s contract formation rules, it may assist to summarise the Convention’s interpretative provisions at this initial stage. These diverge from the common law’s objective approach to contract formation. Art. 8(1) CISG, for example, permits reference to subjective intent ‘where the other party knew or could not have been unaware what that intent was’. Art. 8(2) CISG then provides an objective intent rule where Art. 8(1) CISG’s threshold conditions are not satisfied. Since it will rarely be the case that an addressee will know or could not have been unaware of the other party’s subjective intent, Art. 8(2) CISG’s objective intent test is by far the predominant test applied in practice. The evidentiary basis for determining the intent of a party (or the understanding that a reasonable person would have had) is outlined in Art. 8(3) CISG, which requires that ‘due consideration’ be given ‘to all relevant circumstances of the case including the negotiations, any practices which the parties have established between themselves, usages and any subsequent conduct of the parties’. Preliminary negotiations and subsequent conduct must therefore be taken into account in assessing contract formation under the CISG. This accords with the English position on contract formation, although not on contractual interpretation.

9 The CISG does mention facsimiles (faxes) and telegrams, but was concluded before the creation of the world wide web. Notably, this is also true of the Sale of Goods Act 1979 (UK).
A Question 9: Agreement

The CISG adopts an offer-and-acceptance model of contract formation. As the ‘Call for Evidence’ notes, there are different varieties of smart contracts, ranging from ‘natural language contracts in which some or all of the contractual obligations are performed automatically by … code’, to ‘hybrid contract[s] in which some contractual obligations are recorded in natural language and others are recorded in … code’, to ‘contract[s] recorded solely in the code of a computer program’. Duke’s recent analysis confirms that even where smart contracts consist entirely of code—that is, even in the hardest category of case—they are still capable of satisfying the CISG’s offer and acceptance rules and are thus capable of constituting legally binding contracts under the Convention. Duke’s detailed account of the contract formation process, as it applies to smart contracts governed by the CISG, can be referred to in Appendix 1.

B Question 14: Consideration

Unlike the common law, the CISG does not have an independent consideration requirement for the purposes of contract formation. It is true that offers under the CISG must expressly or implicitly fix or make provision for determining the price in order to meet the threshold of being ‘sufficiently definite’ offers, but if the parties fail to reach an agreement on price, the CISG provides that there is an obligation to pay ‘the price generally charged’ for such goods ‘under comparable circumstances in the trade concerned’. In other words, ‘market price’ may be used as a default price, and contracts therefore do not necessarily fail on account of lacking a specified price alone. Indeed, CISG cases demonstrate a favor contractus


30 Art. 14(1) CISG.

31 Art. 55 CISG.

32 This may be on the basis that the parties intended to derogate from Art. 14 CISG to conclude an open price contract, or where part performance has occurred: Florian Mohs, ‘Article 55’ in Ingeborg Schwenzer (ed), Schlechtriem & Schwenzer: Commentary on the UN Convention on the International Sale of Goods (CISG) (Oxford University Press, 4th ed, 2016) 844, 847–8 [7]–[10].

33 Art. 55 CISG states: ‘Where a contract has been validly concluded but does not expressly or implicitly fix or make provision for determining the price, the parties are considered, in the absence of any indication to the contrary, to have impliedly made reference to the price generally charged at the time of the conclusion of the contract for such goods sold under comparable circumstances in the trade concerned’. Concluding that ‘the dust has settled’ on previous controversy, and that Art. 55 CISG may ‘save’ contracts where the parties have not agreed expressly or implicitly on the price (nor a mechanism to fix it): see Loukas Mistelis, ‘Article 55 CISG: The Unknown Factor’ (2005) 25(1) Journal of Law and Commerce 285, 296. See also Alejandro Garro, ‘Reconciliation of Legal Traditions in the U.N. Convention on Contracts for the International Sale of Goods’ (1989) 23(2) International Lawyer 443.
approach to upholding the contract.\textsuperscript{24} Moreover, with respect to the subsequent modification and termination of contracts, ‘the mere agreement of the parties’ is sufficient under the \textit{CISG}: no exchange of consideration is required at all.\textsuperscript{25} This stands in contrast to the English position which still relies upon the rather strained and highly criticised concept of ‘practical benefit’ in lieu of consideration to support contractual variations.\textsuperscript{26}

The absence of any consideration requirement under the \textit{CISG} should be kept in mind when assessing any consideration-related challenges identified by other Submissions responding to Question 14.

\textbf{C Question 17: Intention to Create Legal Relations}\textsuperscript{27}

The ‘Call for Evidence’ notes that difficulties in finding an intention to create legal relations may arise at common law where agreements are reached entirely on a distributed ledger.\textsuperscript{28} Duke’s analysis draws attention to circumstances where, under non-harmonised US law, the very nature of a smart contract may make it difficult to show that there was an intention to be legally bound.\textsuperscript{29} In the \textit{CISG} context, however, there is no stand-alone intention to create legal relations requirement. This presents little by way of practical issue, as intention to create legal relations would readily be inferred (in the common law context) in the business-to-business transactions that the \textit{CISG} governs. Notably, the \textit{CISG} does not apply to the types of contracts in which intention to create legal relations is often called into question on the basis of social elements, and specifically excludes consumer contracts from its scope.\textsuperscript{30}

Intention is still relevant, however, under the \textit{CISG}’s rules relating to offer and acceptance. An offer must indicate ‘the intention of the offeror to be bound in case of acceptance’,\textsuperscript{31} whilst an acceptance must indicate ‘assent to an offer’.\textsuperscript{32} As identified in this Part’s opening remarks, Art. 8 \textit{CISG}, depending on the circumstances, allows reference to either subjective

\begin{itemize}
  \item \textsuperscript{25} Art. 29(1) \textit{CISG}.
  \item \textsuperscript{26} See Lisa Spagnolo, ‘The International Dimensions of Australian Contract Law’ in John Eldridge and Tim Pilkington (eds), \textit{The Australian Law of Contract in the 21\textsuperscript{st} Century: Debates and Directions} (The Federation Press, 2021) 221, 230–4: comparing, among other things, the UK practical benefit doctrine of contractual variation with the \textit{CISG}’s position.
  \item \textsuperscript{29} Anna Duke, ‘What Does the \textit{CISG} Have to Say About Smart Contracts? A Legal Analysis’ (2019) 20(1) \textit{Chicago Journal of International Law} 141, 159–60.
  \item \textsuperscript{30} Art. 2(a) \textit{CISG}.
  \item \textsuperscript{31} Art. 14(1) \textit{CISG}.
  \item \textsuperscript{32} Art. 18(1) \textit{CISG}.
\end{itemize}
or objective intentions for these purposes. This approach is distinct from the common law approach which, as noted in the ‘Call for Evidence’, focuses on an objective determination.

In the scenario where agreement is reached entirely on a distributed ledger, application of the CISG would allow reference to an extremely wide variety of circumstances (including, in some cases, subjective intent) to determine whether the requisite intention for contract formation purposes is met. Indeed, it has been argued by one author of this Submission that in certain circumstances ‘an intention to be bound may be found even where an offeror lacks any knowledge that a proposal has been made, a situation which could arise by way of automated proposals’. This could include situations where parties have already agreed upon a framework for automated protocols within a smart contract setting.

Given that the ‘contractual language’ used in smart contracts may consist of code, one of the parties may be unaware of the terms contained within what might be viewed (as a matter of law) as an offer. Absent a framework agreed by the parties, this has potential consequences when assessing whether that party intended to ‘assent’ to the offer, so as to validly accept it for the purposes of contract formation under the CISG. At common law, the same problem arises in the context of the ‘battle of forms’. Guidance issued by the CISG Advisory Council suggests that for standard terms to be incorporated under the Convention, there must be both reference to the terms and either awareness of them by the addressee, or the making available of those terms to the addressee. This is a critical test in the cross-border sales context, where standard terms may be difficult to access: especially if expressed in a language or languages other than that of the offeree. Under the CISG, the burden of making terms accessible (and understandable) rests on the offeror, who stands to benefit from their incorporation. By analogy, the inaccessibility and/or incomprehensibility of code could

36 Art. 18(1) CISG.
play a role in contract formation under the CISG regarding smart contracts, because it may result in coded terms not being incorporated into the contract, although this has not yet been tested.

D Question 18: Formality Requirements and Deeds

In the ordinary course, formality requirements do not apply under the CISG. Pursuant to Art. 11 CISG:

A contract of sale need not be concluded in or evidenced by writing and is not subject to any other requirements as to form. It may be proved by any means, including witnesses.

Provided that smart contracts satisfy the Convention’s offer and acceptance requirements, their embodiment in code has no effect on their binding nature under the CISG because of this freedom of form rule.

It is possible for Contracting States to make a declaration under Art. 96 CISG, imposing domestic writing requirements over the general freedom of form rules that are otherwise enshrined in Arts 11 & 29 CISG. Such declarations cannot be contracted out of by the parties to the contract. Nevertheless, only nine States (out of the CISG’s 94 current Contracting States) have made (and currently retain) written form declarations: these are Argentina, Armenia, Belarus, Chile, the Democratic People’s Republic of Korea, Paraguay, the Russian Federation, Ukraine, and Viet Nam. Several States that had previously made Art. 96 CISG declarations – namely China, Estonia, Hungary, Latvia, and Lithuania – have since withdrawn them, in line with a general trend toward States withdrawing their CISG declarations and reservations.


[41] See also Art. 12 CISG.


The UK’s top five trading partners in goods trade, for the first half of 2020, were the United States of America, Germany, China, the Netherlands, and France. All five are Contracting States to the CISG, and none have written form declarations that are currently in force. Nevertheless, even where trade does occur with parties from Contracting States that have made written form declarations, it does not necessarily follow that formality requirements automatically apply. The majority (and preferable) view is that private international law rules then determine whether that State’s written form rules actually apply or not. And even if a declaration State’s laws are applied to matters of form, the State’s domestic rules of form will be applied on their current terms. It is actually now the case that ‘almost all Article 96 reservation States no longer impose writing requirements on international sales contracts in their domestic laws’.

III GOVERNING LAW

As explained in Part I of this Submission, assessing the CISG’s application to smart contracts is important in the context of the Smart Contracts Project notwithstanding the fact that the UK is not yet a CISG Contracting State. This is because the CISG can still apply to international sales contracts entered into by UK businesses, even without the UK’s accession.

In this Part, departing from the order set out in the ‘Call for Evidence’, Question 50 is addressed first, followed by Question 49. This is necessitated by our analysis, in the context of Question 50, of the CISG’s rules on application.

A Question 50: Governing Law

Question 50 of the ‘Call for Evidence’ poses the question: ‘[c]an an express choice of applicable law be embodied in computer code?’ Since some difficulty may arise in integrating express choices of law into code, our evidence relating to this question emphasises a related point: that the CISG’s default operation has wider scope for practical impact in the smart contracts context, as compared to traditional methods of contracting.

Pursuant to Art. 1(1) CISG, the Convention applies as the governing law of a contract if (amongst other things) the parties have their ‘places of business in different States: (a) when the States are Contracting States; or (b) when the rules of private international law lead to the

application of the law of a Contracting State’. While contracts entered into by UK-based businesses will not trigger the CISG’s application pursuant Art. 1(1)(a) CISG, since the UK is not a Contracting State, they may still be governed by the Convention as a result of Art. 1(1)(b) CISG. This will be the case if:

- There is a choice of law clause in a contract in favour of the law of a Contracting State, and that choice of law clause does not exclude the CISG; or
- Relevant conflicts of laws rules that are used to determine the governing law absent party choice (such as those contained in Art. 4 Rome I Regulation) lead to the application of a Contracting State’s law.

The CISG can apply on either of these bases even if one or both of the parties do not have their place(s) of business in Contracting States.52

Empirical evidence confirms that UK law is a popular choice of law in international trade.53 If a smart contract contains a choice of law clause in favour of UK law, the CISG will not apply.54 However, the laws of numerous other States which are CISG Contracting States are also commonly chosen in international trade. In the arbitration context, these include the laws of Switzerland, the United States of America, France, Brazil, and Spain.55 In fact, according to the International Chamber of Commerce’s (the ‘ICC’s’) 2019 dispute resolution statistics, five out of the seven most commonly chosen laws in ICC arbitration in that year were the laws of CISG Contracting States.56

While UK businesses (like businesses anywhere in the world) are likely to favour the application of their home law,57 this will not necessarily be the end result of their contractual negotiations. As a result, UK businesses can be – and actually are – already party to CISG contracts.58 This practical point is noted in a recent analysis by Hayward, Zeller and

54 Provided that the parties’ purported choice of law is valid pursuant to the conflict of laws rules of the forum.
58 See, eg, Kingspan Environmental Ltd v Borealis AS [2012] EWHC 1147 (Comm): where the CISG applied via the parties’ choice of Danish law.
Andersen,\textsuperscript{59} which is attached to this Submission as Appendix 2. The deciding factor here will be the influence of the parties’ bargaining strengths on their choice of law.\textsuperscript{60}

As foreshadowed by the ‘Call for Evidence’,\textsuperscript{61} the nature of choice of law clauses (being ‘non-operational clauses [that] do not embed conditional logic’) may preclude their incorporation into some types of smart contracts.\textsuperscript{62} Nevertheless, this is no obstacle to the \textit{CISG}’s application. The \textit{CISG} constitutes a default legal regime for international sales contracts: where its application rules (as outlined above) are satisfied, it will automatically apply unless its operation is excluded by the parties.\textsuperscript{63} Since \textit{CISG} exclusions would typically be expressed in choice of law clauses,\textsuperscript{64} it stands to reason that the \textit{CISG}’s practical application in the smart contracts context may in fact be wider than is the case with traditional contracts. If smart contracts are less likely to contain choice of law clauses, they are equally less likely to exclude the \textit{CISG} (which may otherwise, by default, apply).

\textbf{B Question 49: Choosing Non-State (Rules of) Law\textsuperscript{65}}

Regarding party choice (in smart contracts) to be bound by platform protocols, the ‘Call for Evidence’ correctly notes that Art. 3(1) \textit{Rome I Regulation} only permits the choice of national law.\textsuperscript{66} Since platform protocols are not part of any national legal system, it follows that Art. 3(1) \textit{Rome I Regulation} does not permit parties to choose platform protocols as a governing law. On the question of whether parties to smart contracts can choose to be governed by platform protocols pursuant to Art. 3(1) \textit{Rome I Regulation}, the answer is an absolute and unequivocal no.

\begin{itemize}
\item \textsuperscript{60} For analysis of the likely extent to which bargaining strength influences choices of law, as opposed to other reasons: see Lisa Spagnolo, \textit{CISG Exclusion and Legal Efficiency} (Kluwer, 2014) 152–81; Lisa Spagnolo, ‘Green Eggs and Ham: The \textit{CISG}, Path Dependence, and the Behavioural Economics of Lawyers’ Choices of Law in International Sales Contracts’ (2010) 6(2) \textit{Journal of Private International Law} 417, 421–33.
\item \textsuperscript{62} Anna Duke, ‘What Does the \textit{CISG} Have to Say About Smart Contracts? A Legal Analysis’ (2019) 20(1) \textit{Chicago Journal of International Law} 141, 150.
\item \textsuperscript{64} See, eg, \textit{Valve Corporation v Australian Competition and Consumer Commission} (2017) 258 FCR 190, 206 [55]: quoting a choice of law clause which selected ‘the laws of Luxembourg, excluding the law of conflicts and the \textit{Convention on Contracts for the International Sale of Goods (CISG)}’.
\end{itemize}
As to whether Art. 3(1) Rome I Regulation ‘should’ permit such a choice,\(^{67}\) the answer is also a very firm no. First, such a reading of Art. 3(1) Rome I Regulation would be inconsistent with the provision’s legislative history. Wider powers of party choice (which would have extended beyond laws contained in State legal systems) were considered and rejected during the Rome I Regulation’s drafting.\(^{68}\) Secondly, reading Art. 3(1) Rome I Regulation in this way would be out of step with the general position taken in State choice of law rules worldwide, which typically only permit parties to choose State law.\(^{69}\) And thirdly, any potential reading of Art. 3(1) Rome I Regulation as permitting the choice of platform protocols would be inconsistent with the provision’s text. Reference can be made here to private international law operating in the arbitration context, where it is necessary for a provision to use language other than ‘law’ (such as ‘rules of law’) in order to support party choice of non-national rules.\(^{70}\) In addition, as a practical matter, platform protocols (unlike State laws) are necessarily incomplete. Even if parties could choose platform protocols as their governing law, which we reiterate is not the case, resort to a supplementary body of law may still be required in any event.

Parties may still incorporate platform protocols as contractual terms, just as they can incorporate the CISG’s provisions as contractual terms instead of having them apply as hard law via a Contracting State’s national legal system.\(^{71}\) or, for that matter, just as they can contractually incorporate the UNIDROIT Principles of International Commercial Contracts\(^{72}\) or other soft law instruments. This is specifically recognised by Recital [13] Rome I Regulation, which confirms that ‘[t]his Regulation does not preclude parties from incorporating by reference into their contract a non-State body of law or an international convention’. Nevertheless, this situation is very different to choosing platform protocols as a governing law. Where platform protocols are incorporated as contractual terms, there is still an underlying applicable (national) law, the mandatory rules of which will prevail over the only-contractually-applicable protocols.\(^{73}\) In addition, contractual terms are always interpreted in context. Thus, where platform protocols are incorporated as contract terms, the very same protocols could conceivably be subject to different interpretations in the context of


\(^{68}\) Benjamin Hayward, Conflict of Laws and Arbitral Discretion: The Closest Connection Test (Oxford University Press, 2017) 201–2 [5.34]. Even the original draft rule would still have excluded ‘private codifications not adequately recognised by the international community’, and thus would not have permitted party choice of platform protocols in any event: Commission of the European Communities, ‘Proposal for a Regulation of the European Parliament and the Council on the Law Applicable to Contractual Obligations (Rome I)’, COM(2005) 650 final, 5.

\(^{69}\) Benjamin Hayward, Conflict of Laws and Arbitral Discretion: The Closest Connection Test (Oxford University Press, 2017) 201 [5.34].


different contracts. 

Taking all of these matters into account, platform protocols are an inadequate substitute for a governing law.

IV CONCLUSION

As Part II of this Submission has demonstrated, with reference to Duke’s analysis, the CISG’s contract formation rules are capable of applying to smart contracts. Furthermore, as Part III of this Submission has confirmed, this matter is highly relevant to UK businesses. Notwithstanding the fact that the UK is not yet a CISG Contracting State, UK businesses may still be (and in practice, are) bound by the Convention on the present state of the law. It also stands to reason, given the nature of smart contracts and the nature of choice of law clauses, that CISG exclusions will be less common in the smart contracts context: widening the practical influence of the Convention’s default operation in relation to UK traders engaged in international trade.

We commend the Smart Contracts Project’s investigation of the capacity of existing laws to adequately govern smart contracts. In the context of Question 56 of the ‘Call for Evidence’ (requesting comment on any other issues), however, we urge the Law Commission’s scoping study to take an international perspective that is inclusive of the CISG. This is important for the legal reasons that have been set out in Part II and in Part III of this Submission. However, this is also important as a matter of commercial necessity. As Duke has noted, ‘without an international legal framework, legal ambiguities surrounding smart contracts may discourage entrepreneurs from developing this technology and thereby deter increasing trade flows and enhancing trade efficiency’.

We would gladly assist the Law Commission with any further matters arising from our Submission. We can be contacted, for this purpose, at the email addresses set out in this Submission on page 1.

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APPENDIX 1:
What Does the CISG Have to Say About Smart Contracts? A Legal Analysis
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Abstract

Smart contracts—contracts written into lines of code that automatically execute all or parts of an agreement—are a relatively new technology, which has raised many questions regarding their validity and formation. This Comment looks at smart contracts under the lens of the United Nations Convention on Contracts for the International Sale of Goods (CISG) and analyzes what its provisions have to say on the validity and formation of a contract. This analysis is written from the internationalist perspective, which favors applying the CISG to issues it addresses even in cases where domestic law might apply. Moreover, this Comment argues that a smart contract used as an international sales contract, which embodies an entire agreement within its code, is valid under the CISG because it can meet the formation requirements of the Convention. More specifically, such a contract can show some clear indication of the parties’ intent, and include an offer, an acceptance, and some sufficiently definite indication of the goods, price, and quantity. In addition, smart contracts have the potential to promote international trade, an outcome that is consistent with the goal of the Convention’s creation. The purpose of this analysis is to address legal issues unique to smart contracts and to reduce legal uncertainty by filling an interpretational gap regarding the CISG’s applicability to smart contracts.

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* J.D. Candidate, 2020, The University of Chicago Law School. I would like to thank the editors of the Chicago Journal of International Law for their feedback and support and Professor Douglas Baird, who served as faculty advisor for this Comment. Any errors are my own.
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I. INTRODUCTION

A smart contract is a set of computer code that “automatically executes all or parts of an agreement and is stored on a blockchain1-based platform.”2 In addition, it lies on a spectrum between an agreement that is entirely in code and the mere automated performance of a traditional paper contract.3 Because smart contracts are designed to reduce transaction costs by making it difficult and costly for parties to breach an agreement,4 interest in smart contracts is on the rise as more businesses seek to use smart contracts for boosting efficiency in international trade.5 In addition, an increasing number of experts are writing about the promise of smart contracts to reduce transaction costs in international trade.6 According to Ramesh Gopinath, the IBM Vice President of Blockchain Solutions, the current supply chain system is inefficient as it relies on the physical movement of a huge number of paper documents “for shipping transactions.”7 This system is “very vulnerable to fraud, human error and inadvertent delays.”8 Wolfgang Lehmacher, the Head of Supply Chain and Transport Industries at the World Economic Forum, sees blockchain and smart contracts as the solution to these transaction costs because of the potential of the technology to make payments and collaboration between traders easier and more transparent.9 Emmanuelle Ganne, former counseler to the World Trade Organization (WTO) Director-

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1 Blockchain is the most well-known type of electronic records system that enables multiple participants to “collectively create, maintain, and update a shared set of authoritative records (the ‘ledger’).” See MICHAEL RAUCHS ET AL., CAMBRIDGE CENTRE FOR ALT. FIN., DISTRIBUTED LEDGER TECHNOLOGY SYSTEMS: A CONCEPTUAL FRAMEWORK 24 (2018), http://perma.cc/W4N6-TW53. Most of today’s smart contracts are based on or tied to blockchain technology. See Scott A. McKinney et al., Smart Contracts, Blockchain, and the Next Frontier of Transactional Law, 13 WASH. J. L. TECH. & ARTS 313 (2018).


5 See, for example, Ian Allison, 94 Companies Join IBM and Maersk’s Blockchain Supply Chain, COINDESK (Aug. 9, 2018), http://perma.cc/9B6W-W8ST; see also Sameet Chatterjee, HSBC Says Performs First Trade Finance Deal Using Single Blockchain System, REUTERS (May 14, 2018), http://perma.cc/7JZW-P65K.

6 See Allison, supra note 5; Chatterjee, supra note 5.


8 Id.

9 See id.
General, published a full report in a WTO publication on the power of blockchain and smart contracts to revolutionize international trade. Of course, a lot of the talk about the benefits of blockchain and cross-border smart contracts may just be hype created by an increasing number of startups in the blockchain industry. As one industry insider noted, all the promising benefits of smart contracts for international trade will take time “because the existing financial infrastructure has been in place for decades and because it is hard to get competing institutions to cooperate.” But the legal and business industries have responded to the hype in hopes of benefitting from its promise. For example, IBM and Maersk have made joint investments to deliver blockchain to the shopping industry (although they are currently struggling to sign up carriers as the unprecedented nature of the blockchain venture leaves many businesses hesitant). In addition, LegalZoom has partnered with a blockchain company to use smart contracts to compose its legal documents, ranging from wills and trusts to trademarks and copyrights.

However, the use of smart contracts for business agreements has raised important questions concerning their legal validity that currently do not have a direct answer in available case law or in relevant international legal texts. There are many different types of smart contracts, which lie on a spectrum of possibilities. On one end of the spectrum is a smart contract that has a code that includes all of the terms of a contract, and a “running program referring to that code is a complete contract undergoing performance.” On the other end is a smart contract that simply digitizes simple performances such as payment and operates together with the terms of an associated traditional paper contract. Given the broad range of possibilities for what a smart contract can be, questions arise as to exactly when along the spectrum a smart contract becomes legally binding. This question often turns on the applicable law determining the issue and the factual circumstances of the case.

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12 See Anujit Kumar Mukhopadhyay, Maersk and IBM Team up to Deliver Blockchain to the Shipping Industry, BLOCKTELEGRAPH (Oct. 14, 2018), http://perma.cc/ZU55-KY9X.
13 Mike Dalton, LegalZoom Will Use Smart Contracts In Legal Documents, UNHASHED (Sept. 18, 2018), http://perma.cc/BDP8-EGHU.
15 Id.
16 See id.
I focus on the U.S. legal context for smart contracts in international trade. Although it does not directly address the formation of smart contracts in international trade, the U.N. Convention on Contracts for the International Sale of Goods (CISG or the Convention) generally governs the formation of many international contracts for goods by international traders whose countries have also adopted the Convention.\(^\text{17}\) The Model Law on Electronic Commerce (MLEC), which governs electronic communications in international trade, also applies to smart contracts and was adopted by the U.S. in 1999.\(^\text{18}\) However, model laws are not considered binding at an international level, so I mainly analyze smart contracts under the CISG, which previous scholars have ignored.\(^\text{19}\)

Thus, in this Comment, I seek to fill in the interpretational gap for the CISG’s applicability to smart contracts in an attempt to reduce the legal uncertainty and confusion that surround smart contracts. The value of U.S. international trade is trillions of dollars, and many developing countries depend on trade with the U.S.\(^\text{20}\) But without an international legal framework, legal ambiguities surrounding smart contracts may discourage entrepreneurs from developing this technology and thereby deter increasing trade flows and enhancing trade efficiency.\(^\text{21}\)

Thus, due to the ambiguity of smart contract use and the possibilities of a breach, it is important to discuss what exactly the CISG has to say about smart contracts. Moreover, smart contracts may help reduce the transaction costs of international trade and thereby promote it.

In this Comment, I argue that smart contracts can, like traditional contracts, meet the contract formation requirements of the Convention’s provisions and thus are valid under the CISG. I also argue that smart contracts are consistent with the principles and goals underlying the creation of the CISG. Section II introduces the current technology of smart contracts and how it can be used for international sales agreements. Section III lays out the provisions of the CISG as well as examining the issue of validity in Article 4 of the Convention. In Section IV, I analyze the validity of smart contracts under the provisions laid out in Section III.


\(^{18}\) See Aaheree Mukherjee, Smart Contracts—Another Feather in UNCITRAL’s Hat, CORNELL INT’L L.J. ONLINE (2018), http://perma.cc/S2Z5-DPGY.

\(^{19}\) See José Angelo Estrella Faria, UNCITRAL: Model Laws as Tools for Legal Harmonization, http://perma.cc/3RE3-7W8R.


\(^{21}\) See R3 & NORTON ROSE FULBRIGHT LLP, supra note 14.
II. SMART CONTRACTS: A BREAKDOWN

A. Definitions and Existing Framework

The term “smart contract”—first proposed by Nick Szabo—refers to “a set of promises, specified in digital form, including protocols within which the parties perform on these promises.” Simply put, a smart contract is a software program that can “automatically execute, verify and enforce the performance” of transactions (such as releasing payment), which are triggered by events (receipt of goods). These events are pre-defined by its software code written in programming languages, such as Solidity. When the transactions constitute fulfillment of a “set of promises” agreed upon by the parties, there may be a legally enforceable contract. Moreover, smart contracts are distinguished from electronic contracts because the “actual agreement is automated and embodied in computer code, rather than in words.” Because smart contracts are automated programs, a transaction under a smart contract, once initiated and all conditions are met, is typically unstoppable by any party to the smart contract. While this immediate and unstoppable execution may reduce transaction costs, an “emergency exit” has been recently developed that can stop the execution of a smart contract once triggered.

The automated and contractual aspects of a smart contract are often compared to that of a vending machine. For example, the typical vending machine follows an “if . . . then” code, with the following terms: if you put the required amount of money in the machine and press the button(s) associated with a Dr Pepper, then the underlying code in the machine will ensure that, after checking

27 Mukherjee, supra note 18.
28 Philipp Pach, Law and Autonomous Systems Series: What is a Smart Contract, OXFORD BUSINESS LAW BLOG (July 9, 2018), http://perma.cc/NBD4-URY.
that the money is valid and sufficient, you get your Dr Pepper. Moreover, the machine will deliver the drink without the need of an intermediary to double-check or execute the transaction. It is this ability to perform transactions independently that makes the contract “smart.”

Blockchain-based smart contracts involve more than just the “if...then” code found in vending machines. As defined by the European Central Bank (ECB), a blockchain is a digital “ledger (book of records) of all transactions,” which are organized and combined in “blocks” that are “chained” or linked together on a decentralized database. This digital record is shared or distributed instantaneously across a network of participating users, also known as “nodes,” and every transaction that is recorded by blockchain is transparent to these users—making transparency an important feature of blockchain. This distributed ledger can also be permissioned and private, meaning that the membership of users who can view and participate in a particular distributed ledger can be restricted, as opposed to permissionless and public ledgers that are open to everyone. Moreover, there is only one source of accurate data (known as the “golden” version); because blockchain uses a consensus technique that ensures that every participating user agrees on the record, there are no “multiple competing sets of records.”

Blockchains have a neutral and immutable aspect in the sense that in order for anyone to make any change to past digital records, a “vast majority of users in the network would need to agree on the change and be willing to spend resources to update all subsequent blocks of the chain.” Because such changes involve a lot of time and money, require a majority consensus, and are immediately transparent to all participants in the ledger, once a transaction is recorded by the blockchain, it is often considered irreversible or “locked in.” This permanency feature explains why blockchain is sometimes described as a “digital stone,”

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33 See id. at 8.
34 Id. at 7.
referring to the way that carvings on stone are physically permanent. The irreversibility, neutrality, and transparency of blockchain contribute to the widespread trust in the integrity of its ledgers and decrease opportunities for fraud. This integrity is maintained by the structure of blockchain technology, which acts “independent[ly] of intermediaries and third-party guarantors.”

Because the code of smart contracts is embedded in blockchain, the code of a smart contract and each transaction that occurs under it are supposed to carry all of blockchain’s characteristics of immutability, neutrality, and transparency. There is only one “golden” version of the code that is locked in and transparent to all. The agreed terms of the smart contract apply to all participating users, irrespective of their real world position or authority.

To give an idea of what a typical smart contract looks like in action, consider the following example:

[S]ay that Company A agrees to purchase 500 widgets from Company B. The parties then translate this agreement into blockchain coding: The block of coding states, “if Company B delivers 500 widgets to Company A by December 1, 2017, at 5:00 PM ESD, then Company A delivers $10,000 USD to Company B.” The blockchain can then be linked to sources known as “oracles.” An oracle is an outside source that provides information to the blockchain smart contract... In our hypothetical smart contract...the oracles would be Company A’s computerized delivery database and the two companies’ bank accounts. Once Company B’s delivery of 500 widgets is confirmed in Company A’s system, the blockchain will automatically trigger Company A’s bank account to transfer $10,000 to Company B’s bank account without any required action by the parties or any verification by a third-party clearinghouse.

As is demonstrated by this example, the first step in a smart contract is often the agreement between the two parties, which the software code will be based on. This agreement should include set conditions that establish what events will trigger a particular transaction. The next step is related to cryptography, or the “practice of secure communication,” aimed at preventing third parties from

37 Custodio, supra note 29.
40 See ISDA & LINKLATERs, supra note 32.
42 See Raza, supra note 39.
43 McCarthy, supra note 30.
reading the content of the communication. If a participant wants to initiate a transaction or send a message to the other participant(s), he or she must authorize the transaction before it is automatically enforced. Blockchain uses public key encryption infrastructure (PKI) for authorization, which relies on two keys: the public key, which is derived from a participant’s account address, and the private key, which acts as a participant’s electronic signature. Every participant has a unique key that he or she uses to “initiate transactions on that distributed ledger,” which is then checked against a “signing authority list” stored in the digital ledger. Participants can use the public key to “verify that the smart contract transaction was initiated by the initiator in possession of the private key and to authenticate the message contents.” This authentication system does away with the need for third-party verification systems. Once the transaction is authenticated and the code is executed, the digital ledgers are updated to reflect the performance of the transaction. Finally, it is very important that the oracles, whose role is to “feed information from the outside world into the ledger to facilitate smart contract enforcement,” are a trustworthy third party that can transmit “accurate and trustworthy data in a secure manner.”

B. Broad Range of Smart Contracts

Of course, the above example is by no means the only manner in which a smart contract may be executed. There are many different types of transactions a smart contract can perform, as well as many different types of smart contracts. Smart contracts lie on a broad spectrum of possibilities. On one end of the spectrum is a smart contract with a code that “constitutes the entirety of the terms of a contract, and a running program referring to that code is a complete contract undergoing performance.” These type of smart contracts are meant to “model commercial relationships” for simple transactions such as automatic payments or

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44 Breeze Asolo, Blockchain Public Key & Private Key Explained, MYCRYPTOPEDIA (Nov. 1, 2018), http://perma.cc/6QME-KDRR.
46 INT’L SWAPS & DERIVATIVES ASS’N & LINKLATER, supra note 32, at 21.
47 See id.
49 See id.
50 R3 & NORTON ROSE FULBRIGHT LLP, supra note 14.
51 See id. at 13.
asset transfers. On the other end is a smart contract that simply digitizes simple performances such as payment and operates in conjunction with the terms of an associated written contract. Somewhere in between is a ‘split’ smart contract model under which “non-human performance is encoded into computer code, and wider human obligations, remedial and other provisions are written into natural language, the two components operating together as a cohesive contract.”

In addition to the existence of many types of smart contracts, there is also a large range of possibilities for the type of contractual clauses that will be incorporated into the agreements. However, not all clauses can be automated or subject to self-execution, so some may be more suitable to automation in smart contracts than others. Such clauses are called “operational clauses,” which “generally embed some form of conditional logic,” and include:

A clause that requires an amount to be payable on a payment date equal to the product of a calculation amount, a floating rate (plus or minus a spread) and a day count fraction; [a] clause that requires an amount to be payable on an exercise date equal to the number of options exercised multiplied by a strike price differential; [a] clause that provides that one party to the contract pays the other an amount equal to the difference between the settlement price and a forward price, with the party required to make such payment being determined by whether the settlement price exceeds the forward price or vice versa; and a clause that requires a party to transfer assets on a particular date that have a value equal to the amount by which a required credit support amount is less than the value of collateral provided, subject to certain formulaic haircuts and adjustments.

These clauses embed conditional logic in the sense that a specified time or event will trigger or require a corresponding action. On the other hand, non-operational clauses do not embed conditional logic and “relate to the wider legal relationship between the parties.” This includes examples such as dispute resolution clauses or choice of law clauses, a statement to the effect that that “a party’s obligations under the legal agreement constitute legal, valid and binding obligations,” and representations in relation to acting in good faith and acting in a “commercially reasonable manner.”


53 See id.


55 INT’L SWAPS & DERIVATIVES ASS’N & LINKLATER, supra note 32, at 10.

56 Id.

57 Id. at 11.
Finally, given the broad range of smart contracts and the different types of agreements that can be embedded therein, questions have arisen as to exactly when along the spectrum is a smart contract considered valid and binding. This question often turns on the applicable law determining the issue and the factual circumstances of the case. Thus, in Section III we turn to exploring the default applicable law for international sales contracts of commercial goods between signatory countries: the U.N. Convention on Contracts for the International Sale of Goods (CISG).

C. Hacks and Emergency Stops

The “DAO Hack” is the most famous example of a successful hack of a smart contract. The DAO, a venture capital fund that operated through smart contracts, raised over $150 million in digital coins that it stored in smart contracts with investors who could collectively vote on how these funds would be spent. However, a hacker managed to steal the equivalent of $79.6 million in digital currency by exploiting a “bug” in the programming code underlying the smart contracts. The smart contract’s irreversible nature made it hard for programmers to stop the hacker’s attack. Even heavily tested codes may contain bugs that are not known until a hacker’s attack reveals it.

To minimize the risks of hacking, computer programmers have developed an “emergency stop” or a “circuit breaker,” which halts the execution of the smart contract if a bug is discovered or in the case of a security emergency such as a hack. The ability to implement an emergency stop is incorporated into the smart contract’s code and can be triggered by pre-authorized participants of the smart contract. However, triggering emergency stops are not costless because

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58 R3 & NORTON ROSE FULBRIGHT LLP, supra note 14.
61 A bug is a technical flaw in a smart contract’s programming code that creates a loophole for a hacker to exploit. See RAUCHS, supra note 1.
62 See Falkon, supra note 59.
63 See id.
64 See Emergency Stop, SOLIDITY-PATTERNS (2018), http://perma.cc/NL6H-7R6C.
66 See id.
executing transactions on blockchain costs money and parties may choose to spend extra time and money to upgrade the contract to remove the bug.67

III. U.N. CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS (CISG)

International trade transactions involve multiple actors and complex processes and require the submission of a multitude of paper documents.68 For example, the typical international trade transaction involves processes related to customs and border procedures, commercial transactions, and trade financing, including a host of documents related to each of those processes.69 Moreover, trade finance is usually a labor-intensive process, with the average transaction involving more than twenty people.70 The paper-and labor-intensive process of international trade increases administrative costs and are “prone to error, losses and fraud.”71 As a result, a number of logistics and transportation companies as well as governments have started to investigate how blockchain and digitalizing trade “could be used to cut paperwork and enhance processes involved in the export of goods.”72 For example, Maersk, a leading player in the transport and logistics industry, has been working actively with IBM to develop a blockchain-based trade platform, which involves the “the automation of various business processes such as import and export clearance via smart contracts.”73 The goal of this platform is to cut costs by reducing the need for bank intermediaries by automatizing money transfers between parties’ bank accounts and reducing the exchange of paper documents as information will be digitized and available to all the players involved in the trade transaction.74

Since smart contract technology is still being developed and has yet to be tested on a wide-scale, global trade basis, its level of efficiency remains uncertain.


68 Ganne, supra note 10.

69 See id.


71 Ganne, supra note 10, at 19.

72 See id.

73 See id. at 42.

Additionally, and importantly, the legal status of smart contracts also remains contested.

However, the Convention on Contracts for the International Sale of Goods (CISG) is the default rule with respect to most international sales contracts between CISG-signatory parties, it is therefore worth exploring what the CISG has to say about the legality of smart contracts.

A. Background of the CISG

The U.N. Commission on International Trade Law (UNCITRAL)—a commission that was created to promote the harmonization of international trade law—developed the text of the CISG, which was later adopted by sixty-two countries, including the U.S., at the Vienna Convention in 1980. The U.S. ratified the CISG in 1986, and the CISG continues to be federal law today. The CISG also remains the default contract law in “seventy-eight other countries, known as ‘Contracting States’ to the Convention,” including the Republic of Korea, China, Mexico, Switzerland, and Italy.

As a result of the U.S. ratification of the CISG, the CISG is the default contract law for contracts between the U.S. and other Contracting States and is federal law that “preempts all conflicting state law.” Of course, under Article 6, parties may “exclude the application of this Convention or . . . derogate from or vary the effect of any of its provisions.” However, unless the parties expressly waive or opt out of the application of the CISG, most courts will hold that the CISG applies to the contract for the sale of international goods if the parties are from different States that have ratified the CISG or the parties included the CISG in the choice of law clause of the contract. Moreover, the failure to negotiate out or to select the CISG as a choice of law in the contract may have unfavorable consequences for one or both of the parties. For example, in Filanto, S.p.A v. Chilewich International Corp, the plaintiff unexpectedly found out that his contract was subject to the provisions of the CISG. He was ultimately barred from

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76 Grbic, supra note 75; Thomas J. Drago & Alan F. Zoccoillo, Be Explicit: Drafting Choice of Law Clause in International Sale of Goods Contracts, METRO. CORP. COUSNs. 9 (May 2002), http://perma.cc/UI9E-LXKZ.

77 Grbic, supra note 75.

78 See id.

79 CISG, supra note 75, at art. 6.

initiating a breach of contract suit that would not have happened had he expressly opted out of the CISG’s terms. In the context of U.S. law, if the parties exclude the CISG, then the Uniform Commercial Code (UCC) governs certain contracts for the sale of goods.

The CISG was created with two goals in mind: 1) to ensure legal certainty and 2) to promote international trade. It aims to achieve these two goals by promoting uniformity in its application, meaning that the interpretation of its provisions should not be “influenced by the concepts used in the legal system of the country of the forum.” This autonomous style of interpretation will ideally avoid the legal uncertainty of applying a particular national law that one party may be unfamiliar with. This clarity in turn will promote international trade, as parties will in theory have an incentive to contract and trade because the CISG, unlike national laws, “does not favor any party to the transaction that it governs,” especially because it “combines both common law and civil law elements.” As the CISG states in its Preamble, “the adoption of uniform rules which govern contracts for the international sale of goods and take into account the different social, economic and legal systems would contribute to the removal of legal barriers in international trade and promote the development of international trade.”

Moreover, the CISG “reflects compromises between common-law and civil-law traditions as well as between developing and developed and controlled economy and free-economy countries. It incorporates these compromises in order to facilitate subsequent adoptions of the Convention throughout the world and to

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81 See Asante Techs., Inc. v. PMC-Sierra, Inc., 164 F. Supp. 2d 1142 (N.D. Cal. 2001).
83 See id.
84 See CISG, supra note 75, at art. 7., which states that:

In the interpretation of this Convention, regard is to be had to its international character and to the need to promote uniformity in its application and the observance of good faith in international trade. Questions concerning matters governed by this Convention which are not expressly settled in it are to be settled in conformity with the general principles on which it is based or, in the absence of such principles, in conformity with the law applicable by virtue of the rules of private international law.

85 Grbic, supra note 75, at 178.
86 See id.
87 CISG, supra note 75, at Preamble.
make it more useful in meeting varying needs of ratifying states.\textsuperscript{88} In the context of international trade, industrialized countries continue to have more bargaining power than developing countries, and UNCITRAL sought to provide a neutral set of laws that developing countries (which also helped to draft the Convention) would approve of and adopt.\textsuperscript{89} As explained by UNCITRAL, small and medium-sized companies located in developing countries often do not have access to a lawyer when negotiating a contract.\textsuperscript{90} Because these companies “may also be the weaker contractual parties and could have difficulties in ensuring that the contractual balance is kept,” the aim of the CISG was to level the playing field in contractual law by creating a “fair and uniform regime.”\textsuperscript{91}

Finally, the CISG is divided into three parts: Part I introduces the scope of application and general provisions, Part II describes the formation of a contract, and Part III describes more detailed rules for issues that often arise in contracting.\textsuperscript{92}

B. The Broad Scope of the CISG’s Provisions

This Subsection focuses mostly on the provisions of the CISG from Section II (Art. 14–24), but also includes some discussion on articles in Section I and Section III, to show the rules covering contract formation by means of offer and acceptance. The CISG’s provisions regarding offer and acceptance is especially critical to the analysis below that smart contracts can be valid under the CISG.

1. To constitute at offer, a proposal should be sufficiently definite, indicate intention to be bound, and be addressed to at least one person.

Article 4 broadly defines the two main areas of contract law that the CISG covers: “the formation of the contract of sale and the rights and obligations of the seller and the buyer arising from such a contract.”\textsuperscript{93} This Comment mainly focuses on the formation of the contract as it more directly relates to the validity of a contract. To understand contract formation under the CISG, one must start with


\textsuperscript{90} CISG, supra note 75.

\textsuperscript{91} See id.

\textsuperscript{92} See Hill, supra note 82.

\textsuperscript{93} CISG, supra note 75, at art. 4.
Article 14, which introduces the requirements of offer and acceptance for the formation of a contract.

Under Article 14 of the CISG, a “proposal for concluding a contract” constitutes an offer if: 1) there is an offer addressed to at least one specific person; 2) the offeror has indicated an intention to be bound in the event of acceptance; and 3) the offer is sufficiently definite because it indicates the goods and expressly or implicitly makes provisions for determining quantity and price. If the proposal addresses an indefinite group of people, then Article 14 requires “a clear indication of whether it is an offer.” Otherwise, the proposal will be treated as merely an invitation to make an offer. With respect to the sufficient definiteness requirement, Article 14 allows the offeror to “implicitly fix[] or make[] provisions for determining the price.” An offeror’s communication may be an “offer” even if it referred to the price as being listed in a catalog if there had been prior course of dealings or the usage of trade recognizes the price as being set out in the catalog.

Finally, there is also a subjective element to the formation of contracts under Article 14 of the CISG, as it requires some manifestation of the readiness of the offeror to be bound by the offer in case of an acceptance. Article 8 explains how this intent can be shown:

Statements made by and other conduct of a party are to be interpreted according to the understanding that a reasonable person of the same kind as the other party would have had in the same circumstances. In determining the intent of a party or the understanding a reasonable person would have had, due consideration is to be given to all relevant circumstances of the case including the negotiations, any practices which the parties have established between themselves, usages and any subsequent conduct of the parties.

According to Article 8, the offeror’s intent to be bound can be proven by all the relevant extrinsic evidence outside of the four corners of the document, even taking into account the statements and the conduct of the parties both during negotiations leading up to formation of the contract as well as after the contract.

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54 CISG, supra note 75, at art. 14.
56 Peter Winship, Formation of International Sales Contracts under the 1980 Vienna Convention, 17 INT’L LAW. 1, 6 (1983); see also CISG, supra note 75 at art. 9, which states:
    This use of prior dealings and trade custom is also made possible by Article 9, which states: (1) The parties are bound by any usage to which they have agreed and by any practices which they have established between themselves. (2) The parties are considered, unless otherwise agreed, to have implicitly made applicable to their contract or its formation a usage of which the parties knew or ought to have known and which in international trade is widely known to, and regularly observed by, parties to contracts of the type involved in the particular trade concerned.
57 CISG, supra note 75, at art. 8.
is alleged to have been performed. In addition, the parties’ intent to be bound can also be shown by usages and practices that parties have established between themselves or that are regularly observed in their particular industry.\(^{98}\) But in circumstances where there are no indications of the parties’ intent, the court or arbitrator should “apply the objective criterion of an understanding that a reasonable person would attribute to the statements and conduct of the party, i.e., to the contract, in the equivalent circumstances.”\(^{99}\) Moreover, while the fundamental elements (goods, quantity, and price) of the contract under Article 14 must be determined in the offer for the offer to be “sufficiently definite,” non-fundamental elements under Article 8 can be “derived from the parties’ statements and behavior, or determined by a court, arbitrator or third person.”\(^{100}\)

Finally, under Article 15 of the CISG, “[a]n offer becomes effective when it reaches the offeree.”\(^{101}\) In the context of electronic communications, the term “reaches” in Article 15 “corresponds to the point in time when an electronic communication has entered the offeree's server.”\(^{102}\)

2. To constitute an acceptance, the offeree’s statement or conduct should indicate assent to the offer.

Under Article 18 of the CISG, an offeree’s acceptance is “[a] statement made by or other conduct of the offeree indicating assent to an offer.”\(^{103}\) Therefore, absolute silence or the offeree’s failure to follow up on an earlier expression of interest does not count as acceptance.\(^{104}\) Moreover, an acceptance becomes effective “the moment the indication of assent reaches the offeror . . . within the time [the offeror] has fixed or, if no time is fixed, within a reasonable time” and

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\(^{99}\) Article 8: Interpretation of Party’s Statements or other Conduct, IICL PACE LAW CISG DATABASE (2009), http://perma.cc/WV8A-NE5G.


\(^{101}\) CISG, supra note 75, at art. 15.

\(^{102}\) CISG-Advisory Council Opinion no 1: Electronic Communications under CISG, IICL PACE LAW CISG DATABASE (2006), http://perma.cc/9YXE-QEJX. The CISG Advisory Council (The CISG-AC) is an entity composed of an independent group of experts that was founded in 2001 by Professor Albert Krizner of the Institute of International Commercial Law. The primary purpose of the CISG-AC is to “issue opinions relating to the interpretation and application of the Convention on request or on its own initiative.”

\(^{103}\) CISG, supra note 75, at art. 18.

thus concludes the offer.  The purpose of this requirement is to ensure that the offeror has the opportunity to learn of the offeree’s acceptance of his offer. In the context of electronic communication, an acceptance becomes effective when “an electronic indication of assent has entered the offeror’s server, provided that the offeror has consented, expressly or impliedly, to receiving electronic communications of that type, in that format, and to that address.”

3. An offeree’s acceptance is not subject to any form requirements and may be proven by any means.

Under Article 11 of the CISG, oral agreements not evidenced by writing for the sale of goods are still enforceable. As Article 11 states: “A contract of sale need not be concluded in or evidenced by writing and is not subject to any other requirement as to form. It may be proved by any means, including witnesses.” Therefore, Article 11 does not contain any particular form requirements for the formation of contracts or acceptances, meaning that the formation of contract will be decided on the basis of the substance of the agreement rather than its form. Recognizing that some Contracting States have domestic laws that require writing formalities for proving the existence of a contract, Article 96 of the CISG allows countries to make a reservation to the applicability of Article 11’s provisions. However, even though U.S. contract law typically requires contracts to be concluded in writing, the U.S. did not make a reservation to Article 11 under Article 96.

Due to the lack of form requirements, we can also infer that a contract “may be concluded or evidenced by electronic communications.” Because the article does not prescribe a particular form, the CISG also allows parties to conclude their contracts electronically, even though “[t]he issue of electronic communications beyond telegram and telex was not considered during the drafting of the CISG in the 1970s.” Moreover, under Article 13 of the CISG,

105 CISG, supra note 75, at art. 18(2).
106 CISG-Advisory Council, supra note 102.
107 See id.
108 CISG, supra note 75, at art. 11.
109 See id.
112 CISG-Advisory Council, supra note 102.
113 Id.
the term “writing” includes telegram and telex. Therefore, as a consequence of Article 13, a contract may also be concluded or accepted by telegram and telex. Article 13 shows how broad the CISG’s definition of “writing” is, which will be important for the analysis below when considering whether smart contracts fall within the Convention’s scope.

4. Unlike the U.C.C., the CISG does not have a parol evidence rule or a perfect tender rule.

Under U.C.C. § 2-202, the parol evidence rule prohibits the introduction of evidence outside of the “four corners” of a clear contract to prove the intent of the parties that otherwise conflicts with the contract’s express terms. Under U.C.C. § 2-601, also known as the “perfect tender rule,” the buyer may reject the goods if they do not conform precisely to the contract. In contrast to the parol evidence rule of the U.C.C., Article 8 of the CISG, as mentioned above, allows the parties’ intentions to be bound by the contract to be proven by all the relevant extrinsic evidence outside of a written contract. Moreover, the CISG standard of “substantial deprivation” for breach of contract is much lower than the perfect tender rule. Favoring performance, the CISG requires a fundamental breach of the contract that would substantially deprive the parties of their entitlements under the contract. As a vaguer standard than the “perfect tender rule,” the substantial deprivation rule of the CISG allows more flexibility for different circumstances and makes it harder for the parties to breach.

Due to these differences between the CISG and the U.C.C., a smart contract under the CISG is much more likely to be enforced. For example, in the event that a smart contract under the CISG is hacked due to its faulty coding, it would be easier for the parties to prove their intent to contract by pointing to other circumstances, such as prior dealings or negotiations. By contrast, if the faulty smart contract code itself led to the breach, a party to a U.C.C.-governed smart

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114 CISG, supra note 75, at art. 13.
115 CISG-Advisory Council, supra note 102.
118 See CISG, supra note 75, at art. 8.
119 See id. at art. 25.
120 See id.
121 See Ramesh et al., supra note 117, at 465.
122 See CISG, supra note 75, at art. 8.
contract would have a harder time showing its intent by simply referring to the “four corners” of the code alone. A party to this contract could argue that
the intention to be bound cannot be found in the code itself as it was intentionally
made vulnerable to hacking. Furthermore, in the event that a glitch or a hack of
the smart contract code leads to a less than optimal performance, it would be
much easier to back out of the contract under a perfect tender rule than under a
substantial deprivation rule.

In sum, under the Convention’s offer and acceptance requirements, broad
definition of writing, liberal evidence rules, and tendency toward enforcement, a
smart contract is likely to be considered valid under the Convention.

C. Limitations on the Scope of the CISG

The CISG only applies to contracts of the international sales of goods that
are between parties whose places of business are in different Contracting States.

The nationality of the parties to the contract in question is irrelevant when
deciding whether the places of business are in different states: only the location
of the parties’ places of business is taken into account in determining the
application of the CISG to the contract. Moreover, the CISG generally applies
to contracts governing the commercial sale of goods, but excludes coverage of
consumer sales and of “goods bought . . . by auction; on execution or otherwise
by authority of law; of stocks, shares, investment securities, negotiable instruments
or money; of ships, vessels, hovercraft or aircraft; of electricity.”

Article 4 of the CISG limits its applicability to the validity of the contract,
stating: “except as otherwise expressly provided in this Convention, it is not concerned with:
the validity of the contract or of any of its provisions or of any usage.” Because
“validity” is not defined in Article 4 or in any of the CISG’s other provisions, it is

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123 Under the revised Article 9 of the U.C.C., security interests are allowed to be created through
electronic records and signatures, suggesting an openness in the U.C.C. to electronic methods of
contracting. See Margo H. K. Tank et al., A Brief Guide to Using Electronic Signatures in Securities
Transactions, 6 PRAC. COMPLIANCE & RISK MGMT. SEC. INDUSTRY 25, 26 (2013),
http://perma.cc/2CSW-UZZS; U.C.C. § 1-201 (AM. LAW INST. & UNIF. LAW COMM’N 1977) (in
which “writing” is defined as including “printing, typewriting, or any other intentional reduction to tangible
form”) (emphasis added).

124 See CISG, supra note 75, at art. 1.

125 See id.

OCEANA PUBLICATIONS 28 (1992), http://perma.cc/6WVH-GZSE.

127 CISG, supra note 75, at art. 2.

128 Id. at art. 4 (emphasis added).
left to the various domestic courts to determine the definition of validity. As a result of the ambiguity of Article 4, legal scholars and domestic courts of different Contracting States have taken different approaches to interpreting the validity question of Article 4. While some approve of a broad interpretation of Article 4, arguing that issues of validity should only be determined by domestic law, others apply a narrower interpretation, allowing the CISG’s provisions to displace domestic law even on issues that in domestic law are usually considered relevant to the validity of a contract.

1. Under a broad interpretation of Article 4, all issues of validity are determined by domestic law.

One approach taken by scholars and courts is to simply disregard the CISG on all matters regarding contract validity. Under this approach, validity is “determined exclusively by domestic law.” For example, in *Geneva Pharmaceuticals Tech. Corp. v. Barr Laboratories Inc.*, the Canadian defendant, who rejected a contract with the plaintiff, argued that there was no breach of contract because there was a lack of consideration. Without looking at what the CISG had to say on the issue of consideration, the U.S. District Court for the Southern District of New York concluded that domestic law should govern this issue, stating that “[u]nder the CISG, the validity of an alleged contract is decided under domestic law . . . [b]y validity, the CISG refers to any issue by which the domestic law would render the contract void, voidable, or unenforceable.”

2. Under the narrow “internationalist” interpretation of Article 4, legal issues addressed by the CISG’s provisions are determined by the CISG.

An alternative approach is to construe Article 4 of the CISG narrowly in light of Article 7, the legislative intent of the CISG’s drafters, and the “except as otherwise expressly provided” clause in Article 4(a). This Comment adopts this approach for the analysis of smart contract validity under the CISG’s provisions.

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133 Id. at 282.
First, the legislative history of the CISG reveals that its drafters created Article 4’s validity provision to be ambiguous to achieve a compromise so as to avoid the postponement of reaching an agreement on the draft. At the same time, however, the drafters “did not intend for the validity exception to provide carte blanche for applying domestic public policy laws to international transactions.”134 After all, the overarching purpose of the CISG was to promote uniformity in the application of its laws.135 The goal of uniformity, however, would be undermined if courts can apply domestic rule of law in place of the CISG whenever they determine that the issue in question concerns validity.136 Moreover, Article 7 of the CISG calls for a “detached characterisation of validity that is committed to the unification purposes of the CISG.” Scholars under this narrow interpretive view agree that this provision applies not only to the interpretation of the CISG’s rules governing the formation of the contract but also to the scope of the CISG’s application contained in Article 4.137

Second, proponents of the narrower interpretation of Article 4 tend to construe the “except as otherwise expressly provided in this Convention” clause in Article 4(a) to refer to the preemption of domestic validity rules whenever an issue is addressed or settled in the Convention through its provisions or general principles.138 This preemption may include issues considered pertaining to the validity of a contract, such as the formation of a contract.

Given the underlying drafters’ intent of promoting uniformity in interpretation and Article 7’s requirement for interpreting the CISG in light of this goal, scholars and courts under this narrow view of Article 4 engage in an “internationalist interpretation” of the CISG.139 This interpretative approach involves looking at the CISG first, without regard for the domestic law, to see whether the facts and the legal issue(s) of the case come under the scope of and are settled by the CISG.140 If both criteria are met, then the “except as otherwise expressly provided in the Convention” clause of Article 4 applies, and “the issue is a non-validity one and domestic remedies are displaced” by the CISG.141 For example, because a form requirement for contracts is excluded by Article 11, courts cannot apply domestic form requirements. Conversely, “for issues which

135 See id.
136 See Schroeter, *supra* note 130, at 97, 104.
137 Leyens, *supra* note 131.
138 See id.
139 See id.
140 See Schroeter, *supra* note 130, at 103.
141 See Leyens, *supra* note 131.
are not addressed by any provisions of the Convention, reference must be made to domestic law."

The preceding two Sections provided a general introduction to smart contracts and a broad overview of the background and provisions of the CISG. The following Section focuses especially on the Convention’s provisions governing contract formation to show that some smart contracts are valid under the CISG.

IV. ANALYSIS OF SMART CONTRACTS UNDER THE CISG

Smart contracts on blockchain platforms are a relatively new technology and there is a broad range of possibilities for what a smart contract can be. Because UNCITRAL has yet to address whether the CISG applies to smart contracts, there is uncertainty as to if and when, along a spectrum of possibilities, a smart contract is a valid contract under the CISG. Smart contracts that are referenced by and incorporated in a fully-developed written agreement are easier to analyze for validity because the scrutiny can focus on the traditional contract elements of the written agreement. Thus, this Comment focuses on the following question: In the context of smart contract use for international trade transactions, can a smart contract at the far end of the other side of the spectrum—the smart contract whose code constitutes the entirety of the agreement—be a valid contract under the CISG? This Comment argues that a smart contract whose code constitutes the entirety of the agreement can be valid under the CISG because it can meet the offer and acceptance requirements of the CISG.

For the sake of simplicity, the following analysis will be centered around a hypothetical smart contract that contains the following agreement translated into code: if Company B delivers one hundred electric motors to Company A by December 23, 2018, at 5:00 PM (Central Time), then Company A delivers $1,000 USD to Company B. In addition, this hypothetical smart contract falls within the scope of the CISG under Article 1 and the parties have not indicated the governing law of their contract. Furthermore, in the event of a dispute, the contract is litigated in a U.S. court.

142 Bar, supra note 134, at 3.
143 This hypothetical is a modified version of the example provided in McCarthy, supra note 30, at 14.
144 I focus on the U.S. court system because—especially given the influence of American jurisprudence and the fact that America is the world’s largest exporter and importer of many different goods—its decisions will likely influence the way smart contracts are handled in the legal realm worldwide. See, for example, A Look at How America Benefits from International Trade, NORWICH U. ONLINE (July 11, 2016), http://perma.cc/D2YG-F77U. See also, for example, THE LAW LIBRARY OF CONGRESS, THE IMPACT OF FOREIGN LAW ON DOMESTIC JUDGMENTS 28 (Mar. 2010), http://perma.cc/YC5K-AKUR (foreign cases are commonly used in the domestic judgments of courts in England and
In arguing that smart contracts are “valid” under the CISG, I define “validity” in this Comment as “formation validity.” In other words, as long as the smart contract meets the contract formation requirements of the CISG, and would not otherwise be void under domestic law on non-formation matters, then that smart contract should be held as legally binding in a U.S. court.

A. Contract Validity under Article 4

Before discussing the validity of smart contracts under the CISG, it is important to first resolve the ambiguity of contract validity created by Article 4. In this Subsection, I will argue that the internationalist approach to Article 4, which treats legal issues addressed by the CISG as being determined by its provisions and not by domestic law, is the appropriate framework for analyzing smart contract validity for contracts made under the circumstances laid out in the hypothetical above.

1. The majority of scholars and judicial precedent favors the internationalist approach to Article 4.

Because the hypothetical smart contract will be litigated in a U.S. court in the event of a dispute, it is appropriate to consider how U.S. courts approach Article 4’s validity clause. With the exception of Geneva Pharmaceuticals mentioned in Section III, U.S. courts have tended to follow the approach of the majority of scholars who favor the internationalist approach. For example, John O. Honnold, a renowned scholar of commercial law and the former Secretary of UNCITRAL, argued that Article 8 of the CISG, which requires courts to give “due consideration” to all the relevant facts and circumstances in determining the parties’ intent, should preempt the domestic parol evidence rule. This argument was based on Honnold’s view that “the Convention displaces domestic law governing validity issues if its provisions and general principles address the issue and provide a solution on the same operative facts.” Because the CISG addressed whether intent to be bound by the contract and its terms can be shown

Wales” and “Indian legislation is under the strong influence of British and American law, and judges often rely on foreign court rulings in interpreting domestic statutes and international instruments”).

145 I focus on formation validity because my main purpose in this Comment is to show that smart contracts could meet the formation requirements for traditional paper contracts under the CISG. Other issues related to validity, such as coercion or duress, are beyond the scope of this Comment.

146 See Leyens, supra note 131.

147 CISG, supra note 75 at art. 8.


by evidence outside of a written document, Honnold concluded that the CISG displaced the parol evidence rule.\textsuperscript{150}

U.S. Courts followed Honnold’s interpretation of Article 8. For example, the Eleventh Circuit in \textit{MCC-Marble Ceramic Center, Inc. v. Ceramica Nuova D’Agostino S.P.A.}\textsuperscript{151} held that Article 8 of the CISG rejected the parol evidence rule. The court maintained that because Article 8 did not require that a contract be evidenced in writing, it was clear that the CISG demanded the consideration of parol evidence to the extent that it revealed the intent of the parties.\textsuperscript{152} In addition, in \textit{Asante Technologies v. PMC-Sierra},\textsuperscript{153} when the parties disputed whether the CISG or state law was applicable to their case, the Ninth Circuit held that the preemption of state law by the CISG was consistent with the congressional intent of ratifying the CISG. The Ninth Circuit further supported this point by pointing to the goal of the Convention to develop uniform international contract law, arguing that it would be frustrated if state law could override any of its provisions.\textsuperscript{154} The Ninth Circuit also used academic commentary to bolster its arguments.\textsuperscript{155}

Therefore, given that U.S. courts tend to follow the internationalist approach of the majority of scholars in considering Article 4’s validity clause, it is appropriate to also take the internationalist approach to the hypothetical smart contract above, which is also situated in the context of the U.S. court system.

2. A broad interpretation of Article 4 is inconsistent with the intent of Congress.

In U.S. law, the issues of contract formation and validity are often intertwined. To give an example, it sometimes requires a written instrument to prove the parties’ “intention to create legal relations”—an important element of contract formation.\textsuperscript{156} In fact, the majority of states require contracts to be in writing for sales of goods worth at least $500.\textsuperscript{157} Without such a written instrument to show that the parties intended to be legally bound, the agreement may be held unenforceable, or invalid. However, this written requirement directly conflicts with Articles 8 and 11 of the CISG, which permits contracts to form without a

\begin{footnotesize}
\begin{enumerate}
\item\textsuperscript{150} See id.
\item\textsuperscript{151} MCC-Marble Ceramic Ctr. v. Ceramica Nuova D’Agostino S.P.A., 144 F.3d 1384, 1390 (11th Cir. 1998).
\item\textsuperscript{152} See id. at 1389.
\item\textsuperscript{153} 164 F. Supp. 2d at 1142.
\item\textsuperscript{154} See id. at 1151.
\item\textsuperscript{155} See id.
\item\textsuperscript{156} Nadis Evans, \textit{First Principles of Contract Formation}, \textit{6 CORP. & COM. DISP. REV.} 1, 18 (Mar. 2018), http://perma.cc/VSX4-2R3L.
\item\textsuperscript{157} U.C.C. § 2-201 (Am. Law Inst. & Urai. Law Comm’n 1977).
\end{enumerate}
\end{footnotesize}
written instrument and allows an offeror’s intention to be bound to be evidenced by facts and circumstances outside of a written document pertaining to the agreement.\textsuperscript{158}

Under the broad interpretation of Article 4, where validity is determined only on the basis of domestic law, a contract that lacks a written instrument when domestic rules require it would be held invalid even though Articles 8 and 11 do not require a written instrument for any contract under its scope. This would make Articles 8 and 11 completely inapplicable to most international sales contracts. However, this outcome would be inconsistent with the intent of Congress in adopting and ratifying the CISG. As mentioned above, Article 96 of the CISG allows countries to make a reservation to Article 11, but the U.S. never made this reservation.\textsuperscript{159} Congress’ silence means the courts’ approach is instructive. Given that the U.S. courts have tended to gravitate toward the narrower interpretation of Article 4’s clause on validity, the internationalist approach to Article 4 is better than the broader approach in considering the validity of smart contracts in the U.S. legal system.

B. Formation Validity of Smart Contracts: The Offer

The provisions of the CISG embody “a liberal approach to contract formation and interpretation, and a strong preference for enforcing obligations and representations customarily relied upon by others in the industry.”\textsuperscript{160} It is in light of this broad approach to contract formation and to enforcement of contract obligations that the validity of smart contracts will be considered in this Comment.

Because contract formation under the CISG is based on the offer and acceptance model, I will begin by exploring whether a proposal to make a contract that is written in code form in a smart contract would constitute an offer under the requirements of Article 14.

To recap, under Article 14 of the CISG, a proposal to enter into an agreement becomes an offer when there is an offer addressed to at least one specific person, the offeror has indicated an intention to be bound by the agreement upon acceptance, and the offer is sufficiently definite because it indicates the goods, quantity, and price.\textsuperscript{161} To go back to our hypothetical smart contract above, Company A is making an offer to Company B to pay $1,000 for 100 of Company B’s electronic motors if the motors are received by a certain time.

\textsuperscript{158} See CISG, supra note 75, at arts. 8, 11.
\textsuperscript{159} See Jurney, supra note 111.
\textsuperscript{160} Genera Pharm., supra note 132, at 281.
\textsuperscript{161} See CISG, supra note 75, at art. 14.
1. It is possible for an offer written entirely in code to be addressed to a specific person.

A proposal to create a contract that is written entirely in code can be addressed to at least one specific person, and this can be accomplished by sending direct messages to the other party in the blockchain-based platform or by email. First, offers directed to a person or a group of people can be translated into code.\textsuperscript{162} For example, AXA, a French insurance firm, is currently testing a product called Fizzy, which “will store and process payments” via smart contracts built on Ethereum’s blockchain.\textsuperscript{163} If a customer buys flight-delay insurance on the Fizzy platform, a smart contract will be created that will automatically compensate them in the event of a flight delay.\textsuperscript{164} Presumably, if smart contract codes could not handle offers addressed to specific customers, then it would not be possible for AXA to test automated payments via smart contracts to specific customers based on certain conditions.

However, to make it even clearer that Company A’s offer is specifically addressed to Company B, Company A can send its proposal in code form directly to Company B. Imagine that Company A and Company B already have account addresses on a blockchain-based platform due to a prior smart contract agreement. Some blockchain-based platforms will allow Company A to copy and paste its coded proposal to initiate a new smart contract into a message system and send it directly to Company B’s address.\textsuperscript{165} There are, of course, other ways for Company A to send its proposal in code form to Company B. For example, Company A could simply copy and paste the code into an email and send it to the appropriate email address of an executive working for Company B. The moment that this message reaches Company A’s server is the moment that the offer becomes effective.\textsuperscript{166}

2. The offeror can indicate an intention to be bound both in and outside of a smart contract.

Under the CISG, the parties’ intentions are of paramount importance in contract formation, so much so that the Convention allows the parties to “vary the effect” of the other provisions on contract formation as long their intentions


\textsuperscript{163} Maria Terekhova, AXA Turns to Smart Contracts for Flight-Delay Insurance, BUSINESS INSIDER (Sept. 15, 2017), http://perma.cc/UC3P-MRED.

\textsuperscript{164} See id.

\textsuperscript{165} See Address-to-Address-Messaging, GITHUB, http://perma.cc/A4T4-TNPC.

\textsuperscript{166} See CISG-Advisory Council, supra note 102.
to be bound by the contract are clear.167 Conversely, even if an offer is sufficiently
definite and is addressed to at least a specific person, a proposal to create a
contract will not be considered an offer if it cannot be shown that the offeror
intended to be bound by the proposal.168 This is because “a proposal does not
always aim at concluding a contract but may perhaps be aimed at taking up
negotiations on a sale.”169 Thus, if an offeror can show its intention to be bound
by a proposal to contract even though the proposal is in pure code form, then it
will be easier to argue that it is an offer under Article 14.

Article 8 allows the offeror’s intent to be bound to be proven by “all relevant
circumstances,” including the statements and the conduct of the parties before and
after the contract has been performed.170 Prior usages and practices established
between the parties or industrial practices can also prove an intent to be bound.
Thus, Company A may be able to show that it intended to be bound by its
proposal to Company B by pointing to prior agreements with similar
arrangements. For example, if Company A had made the same offer laid out in
the hypothetical above once before and had performed the contract, then it can
use this fact as evidence of its intention to be bound by subsequent similar
agreements. In addition, if it becomes industrial practice to send serious offers in
pure code form, then this could also be used to show that Company A made an
offer in accordance with Article 14’s requirements.

Another way to show the offeror’s serious intent to contract is through the
setting up of the smart contract between Company A and Company B. As
mentioned above, smart contracts are self-executing contracts, and once certain
conditions are met, the transactions that the smart contract was encoded to
perform are typically unstoppable without an emergency stop mechanism.171
Thus, if a smart contract is set up between Company A and Company B according
to the agreement laid out in the hypothetical above, then once Company B sends
Company A one hundred motors by the specified time, the smart contract will
automatically execute the terms of the agreement and $1,000 will be sent from
Company B’s account to Company A’s account. Thus, if Company A knew or
should have known the self-executing nature of smart contracts, the very act of
setting up a smart contract between Company A and Company B can be used to
prove Company A’s intent to make a legally binding offer.

167 See Larry A. DiMatteo et al., The Interpretive Turn in International Sales Law: An Analysis of Fifteen Years
GÜZELOĞLU ATT’LY L. 1, 3 (Apr. 13, 2016), http://perma.cc/NE2H-9DTC.
169 Id.
170 See CISG, supra note 75, at art. 8 (emphasis added).
Finally, Company A can also show its serious intent to make an offer by not incorporating an emergency stop in the smart contract code that would have allowed it to halt a smart contract mid-transaction even when it could have. This shows that Company A may have been trying to signal to Company B that it was committed to its offer by setting up a smart contract that was unstoppable once certain agreed upon conditions were met.

3. It is possible for an offer written entirely in code to be sufficiently definite.

An offer written in smart contract code can indicate the goods, quantity, and price that the parties agree to in the contract. For example, currently, smart contracts are used for selling digital tokens in exchange for money or other types of tokens. These smart contracts indicate the price the offeror is willing to sell the tokens for, the goods that are to be transferred (tokens), and the amount of the tokens to be transferred. Similarly, the hypothetical offer above includes the price ($1,000), goods (electronic motors), and quantity (one hundred motors). Thus, it is possible for offers written entirely in code to be sufficiently definite.

C. Formation Validity of Smart Contracts: The Acceptance

Under Article 18 of the Convention, an acceptance is any statement or conduct by the offeree that indicates an assent to the offer. One of the clearest ways that Company B can show through its conduct that it understood and assented to Company A’s offer is by performing according to the terms of the contract without conditioning its assent on additional terms. For example, Company B could accept Company A’s offer by delivering the one hundred electronic motors before December 24th without indicating it wanted the price for the motors to be higher.

Another way Company B could show that it assented to sending the electronic motors according to the terms of Company A’s smart contract is by “provid[ing] its digital signature utilizing a cryptographic [private] key” to sign the transaction before the offer expires on the 23rd of December. Under the

172 See Emergency Stop, supra note 64.
175 See CISG, supra note 75, at art. 18(1).
176 Alan Cohn et al., Smart After All: Blockchain, Smart Contracts, Parametric Insurance, and Smart Energy Grids, 1 GEO. L. TECH. REV. 273, 288 (2017). See also Kevin Werbach & Nicolas Cornell, Contracts Ex Machina, 67 DUKEL.J. 313, 368 (2017) (“The fact that parties submit their cryptographic private
Convention, “signing” a smart contract with a code-based digital signature is as valid as signing a traditional contract with a real or electronic signature. First, under Article 18(2), an acceptance becomes effective and the contract is concluded when “the indication of assent reaches the offeror . . . within the time [the offeror] has fixed or, if no time is fixed, within a reasonable time.”\textsuperscript{177} As stated by Article 11, a contract does not need to be concluded by writing but can be “proved by any means.”\textsuperscript{178} Considering that “any means” refers to a broad range of methods to concluding a contract, signing a contract using code-based technology should be able to fall under this category. Second, an acceptance may be effective when “an electronic indication of assent has entered the offeror’s server” as long as the offeror has had the opportunity to access this indication of assent by the offeree.\textsuperscript{179} As the offeror and party to the smart contract, Company A will be able to access and see all digital signatures and signed transactions by other participants in the smart contract.\textsuperscript{180} Thus, as Company A is able to view Company B’s digital signature and because Company A initiated the wholly code-based agreement, Company A should have adequate notice of and access to Company B’s acceptance in the form of a digital signature.

D. Electronic Contracts under Article 13

Even if smart contracts can meet the Convention’s formation requirements, some scholars still raise doubts about whether a smart contract can even be considered a legal contract given its unique technological character. First, smart contracts were invented long after the Convention was signed, raising concerns about whether the Convention applies to smart contracts even if the original drafters did not contemplate their use in the text.\textsuperscript{181} Second, some scholars argue that smart contracts are not legal contracts because they are not agreements between people but rather merely an enforcement mechanism of an underlying agreement.\textsuperscript{182} To address these two concerns, it is important to first consider Article 13 and the interpretation of its scope.

Although neither the Convention nor its drafters explicitly considered or mentioned smart contracts, the text and legislative history of Article 13, case law,
and subsequent UNCITRAL legislative texts all suggest that smart contracts are legal contracts and included within the scope of the CISG.

First, Article 13 states that “[f]or the purposes of this Convention ‘writing’ includes telegram and telex.” The use of the word “includes” suggests that other forms of communication—including electronic forms of communication—may be considered a “writing” that can be used to prove that there was a contract. The few cases that have considered Article 13 have interpreted it to include more than just telegram and telex. For example, in one case decided by the Supreme Court of Egypt, the Court concluded that the definition of writing under Article 13 was “flexible enough to include telex, fax, e-mail and other electronic means of communication.”

Should smart contracts be considered a form of electronic communication? According to the authors of *Contracts Ex Machina*, Werbach and Cornell, smart contracts do not really communicate anything as they are not themselves legal agreements between actual people. Instead, Werbach and Cornell contend that the actual parties to a smart contract are cryptographic keys, and that the power of the performance of the smart contract is given entirely to the “machine” of the smart contract technology because of its self-executive nature.

UNCITRAL’s legislators, however, take a different view. First, the UNCITRAL Model Law on Electronic Commerce with Guide to Enactment 1996 states that data messages—defined as encompassing “all types of messages that are...in essentially paperless form” and generated automatically by computers—should be treated as “originating from the legal entity on behalf of which the computer is operated.” Thus, the cryptographic keys that the parties use to indicate their assent to the smart contract should be treated as originating from the parties because it is on their behalf that the smart contract is operating. Moreover, if the power of the performance of the smart contract is given entirely to the “machine” of the smart contract technology, it is given because the parties

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183 CISG, supra note 75, at art. 13 (emphasis added).
184 See id. at Art. 11.
186 See Werbach, supra note 176, at 372.
187 See id. at 371.
188 UNCITRAL, MODEL LAW ON ELECTRONIC COMMERCE WITH GUIDE TO ENACTMENT 1996, 26-27 (1999), http://perma.cc/U8VR-D97F. Although the MLEC is not a binding international instrument, it can be used as a tool for interpreting the CISG.
assented to this type of arrangement by agreeing to the protocol\textsuperscript{190} that would automatically and irrevocably enforce the terms of the agreement embodied by the code.\textsuperscript{191} Thus, the execution of the smart contract communicates the agreement of the parties to the underlying agreement embodied within the smart contract code.

In addition, under the MLEC, electronic data interchange (EDI)—the closest technological equivalent to the smart contract—is considered a form of electronic communication whose data messages are not automatically treated as invalid merely because they are in electronic form.\textsuperscript{192} In an electronic data interchange, the electronic exchange of business documents between business partners is automated by computers.\textsuperscript{193} One example of an EDI is when a computer user clicks the “I accept” button to a digital contract in order to begin a relationship with an online retailer.\textsuperscript{194} Werbach and Cornell attempt to distinguish EDIs from smart contracts by noting that, although electronic in form, the substance and execution of EDIs depend on humans, while the substance and execution of smart contracts depend on machines.\textsuperscript{195} However, the substance and execution of smart contracts also depend to some extent on human beings. The immutability of a particular smart contract depends on its protocol, which in turn is determined by its participants.\textsuperscript{196} As mentioned above, parties can create smart contracts that enable emergency stops in case something goes wrong.\textsuperscript{197} A smart contract is created to be immutable for parties that want the extra security that the terms of the smart contract will be enforced.\textsuperscript{198} Moreover, the execution of the smart contract still depends on the actions of its participants. In the above example, Company B could indicate acceptance by signing the transaction with a private key, which would set the transactions in the smart contract in motion.\textsuperscript{199}

\textsuperscript{190} A “protocol” in the smart contract context refers to “technology-enabled, rules-based operations” which “enables actions to be performed, such as the release of payment.” The parties can determine the protocol that will be incorporated in their smart contract prior to initiating the contract.

\textsuperscript{191} See id.

\textsuperscript{192} See UNCITRAL, \textit{supra} note 188, at 4–5.

\textsuperscript{193} See Werbach, \textit{supra} note 176, at 320 n.28.

\textsuperscript{194} See id. at 320–21.

\textsuperscript{195} See id. at 322.


\textsuperscript{197} See id.


\textsuperscript{199} See Cohn, \textit{supra} note 176, at 279.
Furthermore, legislative history suggests that Article 13 expressly included telegram and telex as writings to emphasize that a particular form of a contract was not required under the Convention and to include two forms of communication that facilitated international trade due to their ability to enhance the speed of communication between the parties.\textsuperscript{200} As I will explain in the next Section, including smart contracts under Article 13 would be consistent with the drafter’s intent, because smart contracts can facilitate trade by quickly communicating information from the sellers to the buyers.

E. Legal Issues Unique to Smart Contracts

Smart contracts are unique from traditional paper contracts and EDIs because they can be designed to immediately and irrevocably perform contracts.\textsuperscript{201} The potential irreversibility of smart contract transactions helps to reduce the transaction costs of monitoring performance and reduces the possibility of a breach.\textsuperscript{202} Once set in motion and without an emergency stop mechanism in place, the transactions that a smart contract was encoded to perform are typically unstoppable.\textsuperscript{203} This immediacy and irrevocability also distinguishes smart contract transactions from purchases on Amazon, which are based on executory contracts—when you buy something from Amazon, you are promising Amazon to pay your credit card issuer in exchange for that item, and the transfer of money does not take place immediately.\textsuperscript{204} Thus, if you purchase a book on Amazon, you can still prevent a transfer of money from your bank account by cancelling the order.\textsuperscript{205} By contrast, initiating a smart contract by agreeing to pay for something is instantly and irreversibly enforced, making the smart contract an essential component of the enforcement of the agreement itself.\textsuperscript{206}

The irrevocable aspect of smart contract performance and the potential for hackers to exploit its bugs have led some scholars to argue that the code cannot reflect the agreement of the parties.\textsuperscript{207} For example, Professor Adam Kolber of Brooklyn Law School contends that the code cannot be the entire contract

\textsuperscript{200} See Hill, supra note 82, at 16–17.
\textsuperscript{201} See Sklaroff, supra note 171.
\textsuperscript{203} See id.
\textsuperscript{204} See Werbach, supra note 176, at 341, 349.
\textsuperscript{205} See id. at 349.
\textsuperscript{206} See id.
\textsuperscript{207} See, for example, Adam J. Kolber, Not-So-Smart Blockchain Contracts and Artificial Responsibility, 21 STAN. TECH. L. REV. 198 (2018).
because such an agreement is "limited by the efficacy of the code itself." If a smart contract's code has a bug that ends up being hacked, then arguably the code does not reflect the parties' agreement because the parties intended for the smart contract to be performed without being exploited by hackers.

To get around this issue, parties can incorporate an emergency stop mechanism in the smart contract so that the code reflects the parties' intention to be bound and to prevent any potential hacks. Even if the parties fail to incorporate an emergency exit functionality, parties can point to other circumstances outside of the code to prove their intention to be bound by the code but not by the hacking event. For example, absent a showing of bad faith, parties could show how much they invested in creating precise computer code that was rigorously tested for reliable smart contracting. Moreover, the parties could point to prior dealings that were successfully carried out and similar to the smart contract in question, as well as show how they were severely harmed by the hacking itself.

F. Formation Validity of Smart Contracts: A Policy Rationale

Having established that smart contracts with coded terms that represent the whole agreement can be valid under the Convention's formation requirements, I will address why having this broad approach to the legality of smart contracts is consistent with the goals and principles under which the CISG was created. As stated above, the ultimate goal of the CISG was to promote international trade, and one of the ways they sought to accomplish this was to establish a uniform and fair legal regime for international sales contracts. UNCITRAL hoped that such a legal regime would especially benefit small enterprises as well as traders from developing countries, who typically have a hard time achieving a "contractual balance" with much stronger parties. Including smart contracts within the scope of the Convention would strengthen a uniform and fair regime for contract law because of the potential for smart contracts to strengthen the negotiation power of smaller businesses.

For example, smart contracts can be coded to quickly trace and keep track of products along the supply chain, which would allow producers from developing countries to negotiate higher prices as it could "make it easier for them to prove

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208 Id. at 222.
209 See CISG, supra note 75, at art. 8.
212 Id.
the quality of their products.” Having stronger negotiating power would empower these developers to demand better terms in their contracts and assert their contractual rights. Recently, Oxfam, a global organization that works with local communities to fight poverty, launched a pilot program using smart contract technology to help rice exporters in Cambodia to increase transparency and traceability in the supply chain. This greater traceability is in turn expected to help “empower” the rice exporters in negotiating better prices, not only because it gives them better proof of quality but also because it attracts more competition for their products.

Moreover, if agreements in smart contracts are held as valid contracts under the Convention, then parties will be more likely to consider smart contracts as an alternative way to carry out agreements, an outcome that is consistent with the Convention’s goal of promoting international trade. As mentioned above, international trade, as it is currently carried out, is a complex and inefficient process with huge transaction costs due to its paper and labor-intensive nature.

In certain Asian countries, high transaction costs create more serious barriers to trade than import tariffs do. In addition, among transaction costs, information costs are regarded as one of the most problematic trade barriers, especially when trading partners come from different cultural backgrounds or the partnership is new. These information costs reduce trade flows in part because they create barriers to entry, as trading partners tend to form long-term partnerships to avoid the informational costs involved in starting a new one.

Given that transaction costs reduce trade flows by creating barriers to it, if smart contract technology can reduce some of these transaction costs, it is likely that this will promote international trade. Smart contract technology promises to reduce some of the transactional costs mentioned above by improving the traceability and transparency of transactions to reduce informational costs,

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213 Ganne, supra note 10, at 80. See also Lory Kehoe et al., When Two Chains Combine: Supply Chain Meets Blockchain, DELOITTE (2017), http://perma.cc/VX9L-3NXH.
214 See Ganne, supra note 10, at 85.
215 See Sok Chan, Blockchain Tech to Link up Local Farmers and Foreign Buyers, KHMER TIMES (Mar. 12, 2018), http://perma.cc/H5SB-576K.
216 See id.
217 See Ganne, supra note 10, at 19.
220 See id.
automating processes to reduce labor costs, and digitizing all processes to reduce the reliance on documents.\footnote{See Ganne, supra note 10, at 53.}

The counterargument to this is that the success of smart contract technology is not guaranteed, and the current risk of creating an agreement through a largely-untested smart contract outweighs its benefits. However, as the history of automobiles and laptops has taught us, technology and business can evolve to turn what was once considered a passing trend to a widely-used product.\footnote{See Phil Edwards, 7 World-Changing Inventions People Thought Were Dumb Fails, Vox (June 29, 2015), http://perma.cc/5BK9-RFL3.} Moreover, smart contract technology has evolved quickly in the past few years, responding rapidly to inefficiencies in the system. For example, less than two years after a hacker exploited a loophole in a smart contract’s code that allowed it to steal digital tokens, programmers developed an “emergency exit” option for users to halt smart contract transactions that transfer funds to the wrong party.\footnote{See Emergency Exit, supra note 64; ConsenSys, supra note 28.} Thus, aside from the inevitable kinks that must be ironed out once smart contract use becomes widespread, it is possible for smart contracts to evolve and adjust to the needs of contracting in the international trade industry.

V. CONCLUSION

To conclude, a smart contract whose code constitutes the entirety of the agreement can be valid under the CISG because it can meet the Convention’s requirements for offer and acceptance under Article 14 and Article 18. Even if offerors use pure programming language to communicate a proposal to contract, they can still address specific people in the proposal, show an intention to be bound by the offer upon acceptance, and indicate the goods, quantity, and price they are willing to agree to in the proposal. Offerees can indicate their acceptance to the offer by performing according its terms or by providing their digital signature. Furthermore, smart contract technology has the potential to promote international trade by reducing transactional costs, and confirming smart contracts as a valid alternative to traditional contracts would increase their use, an outcome that is consistent with the goal of the creation of the Convention.

Smart contracts will continue to change and evolve as logistics and transportation companies pour money into developing them for practical use.\footnote{See Ganne, supra note 10, at 92.} Because smart contracts reduce transaction costs and enhance trade efficiency, it is possible that smart contract use for international trade agreements will become pervasive in the future. Thus, is it likely that a future UNCITRAL convention will
specifically addresses smart contracts and their formation, just as the UNCITRAL created the Electronic Communications Convention (E.C.C.) to address the rise of the use of emails in international trade.\textsuperscript{225} Until then, the topic of smart contract validity remains largely unexplored. UNCITRAL and other commentators have discussed smart contract validity under the E.C.C.,\textsuperscript{226} but the E.C.C. has not been adopted by the U.S.\textsuperscript{227}

Smart contracts can function in a similar way to traditional contracts because they can meet the formation requirements for regular contracts under the CISG. Thus, I suggest that UNCITRAL should address smart contracts by treating them as traditional contracts, either by expressly including computer programming language as a part of its definition for “writing” in Article 13 of the CISG, or by creating a new Convention specifically addressing smart contracts that includes most of the same formation requirements that are found in the CISG.


\textsuperscript{226} See, for example, Sara Hourani, Cross-Border Smart Contracts: Boosting International Digital Trade through Trust and Adequate Remedies, UNCITRAL (2017), http://perma.cc/6YZ7-DNBD.

\textsuperscript{227} See United Nations Convention on the Use of Electronic Communications in International Contracts, supra note 225.
APPENDIX 2:
INTERNATIONAL AND COMPARATIVE LAW QUARTERLY 607
THE CISG AND THE UNITED KINGDOM—EXPLORING COHERENCY AND PRIVATE INTERNATIONAL LAW

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Abstract The United Kingdom remains one of the world’s last industrialized nations not to have adopted the CISG. The UK CISG debate has endured for decades, with existing analysis largely focusing on competition, assessing the relative merits of the CISG and English law. This article’s analysis is complementary; focusing instead on coherence, and the private international law implications of UK accession. This article assesses contractual interpretation, and commodity sales, within an overarching private international law framework. Recognizing the necessity of existing competitive analyses, it makes the case for UK CISG accession on the basis of its complementary coherency perspective.

Keywords: CISG, commodities, contractual interpretation, harmonization, private international law, sale of goods, Sale of Goods Act.

I. INTRODUCTION

The United Nations Convention on Contracts for the International Sale of Goods1 (‘CISG’) is widely regarded as a success story.2 It is an instrument of harmonization, seeking to reduce barriers to trade, and improve international economic well-being.3 The CISG has 89 Contracting States, with Palestine most recently acceding in December 2017.4 Estimates place over 80 per cent

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3 Preamble [3] CISG.

of the world’s goods trade as potentially governed by the CISG, subject to parties opting out, addressed in Parts III and V below. The CISG is an important instrument in the regulation of international sales.

Despite its reach and success, the United Kingdom has not adopted the CISG. It remains one of the world’s last industrialized nations to resist accession. This article argues for UK accession to the CISG. Though much has been written on this topic, this article explores issues of coherency and private international law — themes absent from existing scholarly analyses.

The UK CISG debate is complex, reflected in its long history, and its presently-intractably-opposed positions. Existing literature takes a competitive perspective, assessing the relative merits of the CISG and English law. This type of analysis is both inevitable and useful — its focus is on merchant needs, the ultimate touchstone in matters of commercial law. Nevertheless, it is not the only type of analysis which may be employed. This article’s coherency perspective is a useful complementary analysis which, alongside existing competitive literature, supports the case for UK accession.

II. THE CISG AND THE UNITED KINGDOM

With its objective of promoting international trade, adopting the CISG might appear entirely consistent with UK interests. The UK has always had an involvement with the Convention, from its very drafting. For over 30 years, it has circled the CISG, not unlike a cat circling a bowl of cream — committing in theory, but never actually advancing to ratification.

The CISG was carefully crafted, with one key goal being to achieve global acceptance. It grew from highly unsuccessful antecedents, thought of as not taking into account all of the legal diversity of the world’s States. The UK (amongst only a handful of States) adopted these antecedents — they are still technically in force, though in practice are never used. The CISG was drafted at

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5 Schwenzer (n 2) 1.
7 Portions of this Part have been adapted from CB Andersen, ‘Of Cats and Cream – The UK and the CISG’ in I Schwenzer and L Spagnolo (eds), Growing the CISG (Eleven International Publishing 2016) 1.
9 Andersen, ‘Of Cats and Cream’ (n 7) 1.
diplomatic conferences spanning 13 years, enjoying the participation of 62 States, and other intergovernmental and non-governmental organizations.12 This ensured a reconciliation of legal traditions, and the development of a globally acceptable law for international sales.

The UK was well represented at these proceedings. It was active in the CISG’s drafting, ensuring that compromises necessary for its compatibility with English law were debated and considered. In some cases, the UK’s views did not prevail. For example, it unsuccessfully proposed two amendments to the definition of fundamental breach, now found in Article 25 CISG.13 Nevertheless, the common law’s influence can be seen across many CISG provisions.14

Following the CISG’s drafting, a comprehensive comparative and consultative report on its UK adoption was compiled in 1989 by Barry Nicholas, an esteemed Oxford professor and delegate to the drafting conferences.15 This report recommended UK accession. But the UK did not go on to ratify, despite its active role in promulgating the CISG, and its initial conclusion to do so.

Following this 1989 report, other papers from the UK’s then-styled Department of Trade and Industry (‘DTI’) steadfastly advocated accession.16 Accession was part of the political platform of the New Labour party, before taking power in 1997.17 And in 2005, Lord Sainsbury famously stated, in the House of Lords, that the UK ‘intends to ratify the [C]onvention, subject to the availability of parliamentary time’.18

This qualification reflects the underlying reason for the UK’s failure to accede. The problem has always been a distinct lack of urgency.19 And now (more than ever) parliamentary time is at a premium, with the UK

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12 UNCITRAL, ‘Texts Adopted’ (n 8) 149 [3] and [5].
17 Andersen, ‘Of Cats and Cream’ (n 7) 2.
18 HL Deb 7 February 2005, vol 669, col WA86.
progressing its separation from the European Union by means of a highly contested Great Repeal Bill.20

At one stage, a Member of Parliament was to introduce a Private Member’s Bill concerning the CISG. When falling seriously ill, it was not a priority to replace him.21 But for that illness, the CISG’s adoption would have been considered by Parliament.22

When the BERR wanted to investigate a non-Parliamentary route to ratification, this was never achieved.23 In 1997, when the DTI recognized the risks of UK isolationism as a non-CISG State, interest in ratification was renewed; 450 consultative documents were sent to relevant stakeholders, with 36 replies received24—a staggeringly low response rate. Only seven resisted adoption, but the overall rate of response from legal and trading communities was unsupportive.25 Recent indications from the BEIS give an unsurprising message—the UK does wish to ratify, though it is not considered a priority.

Despite its lengthy history, the UK CISG debate persists to this day, with two contemporary events ensuring the issue remains live. First, 2011 saw the European Commission’s proposal for a Common European Sales Law (‘CESL’).26 The risk of an international sales law competing with non-harmonized English law suddenly seemed alarmingly real. Voices in the City of London were supportive, then, of adopting the CISG to keep CESL at bay. As of 9 December 2015, the project has effectively been abandoned, in favour of one addressing digital content sales, and digital contracting.27 CESL’s threat as a competitor to the CISG is eliminated, though UK opposition to CESL managed to reawaken interest in the Convention.28

Secondly, negotiations are underway for the UK’s European Union exit, taking effect on 29 March 2019, following 23 June 2016’s historic ‘Brexit’ referendum. That the CISG may figure within this process may seem counter-intuitive. A key Brexit campaign theme was the reclamation of sovereignty, and by voting to leave the EU, the UK has expressed a desire to break coherency with much of Europe. Nevertheless, Brexit is causing ‘massive uncertainty’ for UK and global markets,29 and post-referendum efforts to re-secure

24 ibid 483.
25 ibid.
28 See generally Andersen, ‘Of Cats and Cream’ (n 7).
coherency with the world at large are underway—including through trade negotiations with major economies and current EU partners. CISG accession represents one possible ingredient of this overall effort.

This article’s analysis focuses on themes of coherency and private international law, as well as the principle of party autonomy. Though used in the paragraph above in a general sense, the term coherency is given a particular meaning in the following analysis, referring to the effectiveness (or otherwise) of the interactions between various aspects of English private law. This definition explains the relevance of private international law, being ‘that part of the law of England which deals with cases having a foreign element’. One of these parts would, upon UK accession, be the CISG—necessarily implicating foreign case elements, being concerned with international sales. Finally, with respect to party autonomy, this term is used in two senses—first, private international law party autonomy (regarding party choice of the governing law); and secondly, contractual party autonomy (the choice of contractual terms, within a governing law). Taking all of these definitions on board, the key question asked by this article is: if the CISG were adopted, how would it work alongside English law—effectively, or otherwise—in regulating international sales?

This article’s coherency analysis is therefore complementary to existing literature, which has been competition-focused; assessing the CISG’s merits as compared to English law. CISG proponents argue that accession generates real harmonization gains. There is an abundance of English language CISG case law and literature, and much translated case law, making the CISG highly accessible compared to many non-harmonized State laws. The grand old man of English commercial law, Professor Roy Goode himself, has advocated UK accession for over 27 years.

31 L Collins (ed), Dicey, Morris and Collins on the Conflict of Laws (15th edn, Sweet & Maxwell 2012) 3 [1-001].
On the other hand, CISG critics argue that its terms are often vague and imprecise.\textsuperscript{36} When compared to non-harmonized English sales law, there is real force in this argument. Criticism is particularly directed at Article 25 CISG, defining fundamental breach\textsuperscript{37}—one of the Convention’s preconditions for avoidance. Since avoidance is a self-help remedy, uncertainty ‘becomes a powerful disincentive to avoidance’,\textsuperscript{38} given that unjustified avoidance is itself a fundamental breach.\textsuperscript{39}

Non-harmonized English law, on the other hand, is more receptive to avoidance.\textsuperscript{40} In this regard, self-interest in preserving English law’s frequently-chosen status for commercial contracts and commodity sales (and London’s status as a major arbitral centre) motivates perpetuating the status quo.\textsuperscript{41}

CISG accession would involve the UK adopting a new body of law for international sales. At the UK CISG debate’s heart is one fundamental question: should the UK commit itself to two bodies of sales law, or one? This question necessitates extensive analysis of the CISG’s merits, compared to English law.

Nevertheless, other arguments add complexity to the debate, demonstrating the limits of exclusively competitive analyses. For example, China is an important UK trading partner,\textsuperscript{42} and is a CISG Contracting State. Even aside from its CISG membership, however, China’s 1999 contract law reforms took the Convention as an essential reference point.\textsuperscript{43} English traders might be more successful in persuading Chinese counterparties to agree to English law, rather than Chinese law, should English law incorporate the CISG. From a Chinese party’s perspective, the governing law would then more closely resemble its own, compared to ordinary English sales law.


\textsuperscript{38} ibid 915–16.


\textsuperscript{40} Bridge, ‘Avoidance for Fundamental Breach’ (n 37) 917 and n 32; Bridge, ‘A Law for International Sales’ (n 14) 19 and n 8.


\textsuperscript{42} See generally House of Commons Library, ‘Statistics on UK Trade with China’ (10 November 2017) \textless{}http://researchbriefings.files.parliament.uk/documents/CBP-7379/CBP-7379.pdf\textgreater{}.

As with competitive analyses, this article’s coherency analysis focuses on merchant needs, though approached from a different private international law perspective. This article’s analysis is not so much grounded in certainty, frequently invoked against UK CISG accession, but in freedom and choice. Alongside certainty, party autonomy (in both its private international law and contractual manifestations) is a key merchant need.45

This article makes the case for UK CISG accession on this basis of its novel coherency perspective. Admittedly, the CISG’s situation within domestic legal systems (a key point underpinning this article’s perspective) is well understood. However, what is new about this article is its explicit analysis of the UK CISG debate within this context. It is not suggested that this matter is not understood by CISG critics, however, the three issues addressed in this article demonstrate that it is far from trivial to locate the CISG as a potential part of UK law. First, in Part III, this article addresses the private international law implications of UK accession—the basis of its coherency perspective. Secondly, in Part IV, it applies that perspective to philosophical differences between both bodies of law, evident in their contractual interpretation methodologies. Finally, in Part V, this article considers the potential interaction of the CISG and non-harmonized English law, regarding commodity sales—a practical application of its coherency perspective.

Commodity sales are an important part of England’s trading profile, and commodity contracts commonly choose English law. The Sale of Goods Act 1979 (UK) (‘SGA’), alongside a substantial body of case law, currently regulates all sales (including international and commodity sales) governed by English law. Existing literature has dealt with the CISG’s capacity to regulate commodity sales, compared to English law; this article instead explores how the CISG, the SGA and trade terms might all jointly regulate commodity sales, as part of an overall English sales law regime.

III. THE CISG’S POTENTIAL UK APPLICATION AND PRIVATE INTERNATIONAL LAW

Understanding this article’s coherency perspective, and its distinction from existing competitive analyses, is achieved by exploring the CISG’s application at private international law. This is a simple, yet easily overlooked, issue. Upon accession, the CISG would become part of English law—regardless of the trade sector involved, the litigation or arbitration

47 Bridge, ‘A Law for International Sales’ (n 14) 27 and 40.
context or whether parties are simply seeking to ascertain required performance. Coherence is a useful complementary perspective as competitive analyses risk implying, incorrectly, that English law and the CISG would have fundamentally different natures.

A. The CISG’s Nature as International Law

As explained in Part II, it is not suggested that CISG critics fail to understand its basic nature as a legal instrument, or the effects of its adoption. However, the risk of this implication arises as some articulations of the competitive viewpoint presuppose that the CISG and English law are (and would continue to be) different things.49

The CISG is international law; a treaty, intended to be binding on Contracting States. If this were the start and end of the matter, this presupposition would hold. A simple analysis of the relative merits of the CISG and English law would be a more definitive exercise.

B. The CISG’s Nature as Domestic Law

Though itself international law, the CISG becomes part of a Contracting State’s domestic law when adopted. The CISG is therefore not independent of Contracting States’ laws; it becomes their law, for international sales.50 It creates private rights and obligations, in addition to State-to-State obligations created at public international law.

Australia’s position is an interesting comparator. CISG accession created obligations between Australia and other Contracting States at public international law. Local legislation then gave the CISG effect under Australian law, so that it may create private rights and obligations as well.51

Each internal Australian state and territory has enacted domestic goods legislation, based on the Sale of Goods Act 1893 (UK); with separate legislation also giving effect to the CISG.52 In New South Wales, a typical jurisdiction, the Sale of Goods (Vienna Convention) Act 1986 (NSW) attaches the CISG as a schedule, gives the Convention ‘the force of law’,53 and ensures that its provisions ‘prevail over any other law in force in New South Wales to the extent of any inconsistency’.54 The equivalent Sale of Goods (Vienna Convention) Act 1986 (Qld) formed the basis of a Draft Sale

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49 See, eg, Zhou (n 32) 673–5.
52 cf Goods Act 1958 (Vic) Part IV.
54 ibid section 6.
of Goods (United Nations Sales Convention) Act 199–, prepared by the Commonwealth Secretariat.55

Australian case law recognizes the CISG’s domestic character. *Roder v Rosedown* explained that ‘[t]he Convention has become part of the law of Australia’, so ‘is not to be treated as a foreign law which requires proof as a fact’.56 Similarly, *Olivaylle v Flottweg* described the CISG’s Victorian enactment as ‘an “Australian law”’ when interpreting a contract’s choice of law clause.57

Upon accession, the UK would be bound at public international law to implement the CISG’s terms. Once adopted, the Convention would also constitute domestic law, binding private parties in individual transactions. The CISG’s nature as domestic law is well understood at large, however it has implications for the UK CISG debate which are useful to explicitly acknowledge. From a private international law perspective, the CISG and English law would not compete, in the ordinary sense of that word. Rather, the CISG would become part of English law, with specific rules (like any area of English private law) delimiting its scope of application. Just as the SGA has conditions for its application, identifying when it (rather than only the common law) governs a contract,58 the CISG’s application rules would identify when it (rather than only the SGA and/or the common law) applies. The CISG would constitute an additional layer in UK sales law; an extra option for parties to consider when negotiating international sales and choosing to exercise (or not exercise) their private international law party autonomy rights to exclude the instrument.

Coherence is a useful complementary analysis because the CISG’s application would not be mutually exclusive of the SGA, nor the common law. The SGA and the common law already interact; that different internal bodies of law may govern a single sales contract is already reality in the UK. The SGA relies upon judicial interpretation for its application,59 with case law substantially fleshing out its application to commodities contracts. It also applies in conjunction with the common law of contract,60 as well as other aspects of English law, such as bankruptcy law.61 Relatively more forceful articulations of the competitive view, seeing the CISG as fragmented compared to English law,62 fail to appreciate this common ground.

57 *Olivaylle Pty Ltd v Flottweg AG [No 4] (2009) 255 ALR 632 (FCA) 642 [28]. Though the CISG was in principle within the parties’ choice of law, the clause was qualified, providing for ‘Australian law applicable under exclusion of UNCITRAL law’. The Convention was therefore excluded on the facts of this particular case.
59 Carter (n 45) 93–4.
61 ibid sections 62(1) and (3).
62 Zhou (n 32) 673–5.
C. The CISG as a Potential Part of United Kingdom Law

The CISG’s application at private international law involves a sophisticated interface with the State law of which it forms part. Choice of just the CISG is possible, and formed the premise of (part of) a recent empirical study. Nevertheless, the CISG usually applies because a Contracting State’s law brings the Convention’s application with it.

To be precise, should parties choose the CISG in itself, the legal effect of that choice differs depending on the context. In arbitration, parties are often permitted to choose ‘rules of law’, allowing them to exercise private international law party autonomy rights to choose non-national rules as governing. In litigation, where choice of law is restricted to State law, choosing the CISG itself instead amounts to an exercise of contractual party autonomy, incorporating its provisions as terms. Since incorporating the CISG as contractual terms in whole or part (where a contract is governed by English law) is already possible, it might be queried what additional advantage UK accession would bring. Nevertheless, this status quo is not functionally equivalent to the CISG’s application as law, subject to parties opting out.

Even putting aside the fact that incorporated terms are subject to the governing law’s mandatory provisions, given the SGA is largely comprised of default rules, other legal implications of accession remain. As a matter of private international law, the CISG is incapable of regulating contract formation where its provisions are only incorporated as contractual terms, significantly restricting its sphere of application. The Convention’s harmonization objective would also be at risk where contractually incorporated, as its interpretation would become contractual (rather than statutory); even identically worded clauses can be given different meanings in different contracts, since contractual interpretation necessarily occurs in context. Further, incorporation pits Article 8 CISG’s contractual interpretation rules (addressed in Part IV) against Article 7 CISG’s rules governing the Convention’s own interpretation—the Convention itself having contractual force.

From a practical perspective, given the opt-out practices addressed in Section D, it may be easier to ask parties to opt-out of the CISG than asking interested...
parties to affirmatively opt-in by incorporation. And given potentially-continuing UK/EU trade relations after Brexit, and the China/Europe trade alliance being pursued through the One Belt One Road initiative, having a general awareness of the CISG and its full legal application is becoming increasingly important for UK traders. For all of these reasons, the CISG’s application as one potential part of UK law merits consideration.

Central to the CISG’s interface with State law are its preconditions for application, contained in Articles 1 to 5 and 100 CISG, marking the perimeter between its operation and non-harmonized State sales law.

Article 4 CISG demonstrates that the Convention’s subject-matter scope is limited, governing only contract formation and party rights and obligations. Two matters are specifically excluded—validity in Article 4(a) CISG, and property’s passage in Article 4(b) CISG. It is clear, however, that all other issues—not just these examples—fall outside of the Convention’s coverage. The CISG therefore endorses an ‘eclectic model’ of regulation, operating in conjunction with other bodies of law. The Convention actually presupposes, rather than excludes, the operation of private international law. Case law abounds recognizing the CISG’s limited scope, with private international law identifying legal rules governing matters outside those covered by Article 4 CISG.

If the UK acceded, non-harmonized English law would remain applicable to matters outside the CISG’s scope, and would continue to govern sales contracts in their entirety where parties opt-out in accordance with their Article 6 CISG private international law party autonomy rights. The common law of contract, the SGA or both (alongside other areas of English law) would continue to apply and supplement the CISG.

D. The CISG and United Kingdom Law—Coherence and Competition

English law’s continuing supplementary role at private international law supports the usefulness of this article’s coherence perspective. But what exactly does it mean to say that the CISG would become part of (and apply as part of) English law? This question goes to the heart of the coherence idea itself.

As already demonstrated, the CISG works alongside private international law, and supplementary bodies of substantive law. Three ways that the

Convention interacts with State law are explored here, along with their implications for the UK CISG debate. The first arises through Articles 1(1)(a) and 1(1)(b) CISG; the second because of Articles 4 and 7(2) CISG; and the third is evidenced in Article 6 CISG’s ultimate preservation of party autonomy.

Articles 1(1)(a) and 1(1)(b) CISG cause the Convention to apply to an international sale because it is part of the sale’s governing law. The CISG then relies upon that law for essential support.

Pursuant to Article 1(1)(a) CISG, the Convention applies if both parties are from Contracting States. This can be seen as direct application, through the Convention’s own conflict of laws rule. Alternatively, Article 1(1)(a) CISG can be understood as an internal tool, demarcating the Convention’s application as against non-harmonized State law, as suggested in Section C. Private international law identifies a State’s law as applicable; it includes the CISG; and the CISG then applies (as part of that law) through Article 1(1)(a) CISG, if both parties come from Contracting States.

Pursuant to Article 1(1)(b) CISG, the Convention also applies if the CISG is part of the governing law, even if one or both parties are not from Contracting States. In other words, an applicable law analysis leads to a particular State’s law, and the CISG is part of that law—even if not part of another law that could have potentially applied. Article 1(1)(b) CISG triggers the Convention’s application where a Contracting State’s law is chosen by the parties, and also where it is determined applicable by a court or tribunal absent party choice.

Articles 4 and 7(2) CISG evidence the essential supporting role retained by State substantive law. As explained in Section C, Article 4 CISG sets out the Convention’s subject-matter scope. Matters other than contract formation, and party rights and obligations, are necessarily subject to another law. In other words, where a Contracting State’s law governs, the CISG applies to those matters within its scope, and other legal issues are governed by the balance of that State’s law. As a matter of private international law, the common law and the SGA would both supplement the Convention’s potential UK application. Validity and property, specifically identified in Articles 4(a) and (b) CISG, provide good (respective) examples.

Under the CISG, validity matters “are those where a contract is void ab initio by operation of law or rendered so either retroactively by a legal act of the State or of the parties.” The English common law would supplement the CISG in

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78 Jayme (n 75) 32–3 [3.1].
79 Schlechtriem (n 74) 788.
governing vitiating factors such as fraud and duress. One potential difficulty in this application of common law arises where a misrepresentation, allowing rescission at common law, has become a term of the contract—and doesn’t satisfy the CISG’s high standard for avoidance. As the CISG displaces non-harmonized State law to its scope’s extent, this exceptional issue would be determined under the CISG. Though this example focuses on the meaning of ‘validity’, to illustrate a particular supplementary application of the common law, it is acknowledged that all elements of Article 4 CISG must be read together in defining the CISG’s subject-matter scope under that provision.

Regarding property, the CISG addresses party rights and obligations concerning property, but not when and how property passes; nor do trade terms, such as Incoterms 2010. Property’s passage is left to the otherwise applicable State law. Under English law, the SGA would supplement the CISG.

Under the SGA, where goods are specific or ascertained, property passes at the time intended, assessed by reference to the contract, party conduct and the circumstances of the case. Five presumptive rules contained in the SGA, section 18 are used to determine intention, absent contrary indication. Like the SGA as a whole, they have shaped the law in other common law States, including CISG Contracting States, where similar legislation already supplements the Convention in this way. As an important practical matter, given their common use in international sales, English law would continue to govern retention of title clauses. These clauses maintain ownership rights in a seller until the price is paid, falling within the Article 4(b) CISG property exclusion. Thus while Professor Treitel suggests UK accession to the CISG ‘would produce one of two effects’—results significantly different to English law, or the production of uncertainty—this is not so for property

passing. As a matter of private international law, should the UK accede, the CISG’s position on property is the English position on property.94

The application of State law and the CISG are therefore inherently connected. It is not the case, as put by Zhou, that parties must ‘choose [the] contract law of one jurisdiction and [the] property law of another’95—at least where the CISG applies as part of a governing law, rather than as incorporated contract terms. Parties choose a Contracting State’s law, and different elements of that law govern different legal issues. State law supports the CISG’s application, given Article 4 CISG, and the Convention’s limited subject-matter scope. It also does so through Article 7(2) CISG, for matters within the Convention’s scope, but not expressly settled by it.

For these internal gaps, Article 7(2) CISG requires that a solution be sought from the Convention’s general principles, before resorting to the otherwise applicable law. Being more akin to a civilian code, recognized in New Zealand’s implementing legislation,96 the CISG’s first recourse to general principles differs to gap filling for ordinary English legislation.97 From a competitive perspective, some uncertainty is necessarily implicated. Nevertheless, Article 7(2) CISG also emphasizes the Convention’s interaction (and coherency) with State law, if no general principle is found.

The third way in which the CISG interacts with State law is through Article 6 CISG. This provision preserves party autonomy rights to exclude, derogate from or vary the effect of the Convention’s provisions; the first right being private international law party autonomy, with the latter two reflecting contractual party autonomy. Article 6 CISG has been a matter of quite some interest, and was the subject of recent analysis by the CISG Advisory Council.98 Independently of the UK CISG debate, much attention has been directed at the provision,99 automatic opt-out practices100 and what will or will not constitute opting out.101 Within the debate, the provision is identified as a means by which problematic aspects of Article 25 CISG may be overcome.102 Article 6 CISG ensures that specific merchant expectations and needs can be protected; provided merchants are educated as to the provision’s appropriate use.103

95 Zhou (n 32) 674.
96 Contract and Commercial Law Act 2017 (NZ) section 205.
97 Bridge, The International Sale of Goods (n 19) 511 [10.45].
102 Bridge, ‘Avoidance for Fundamental Breach’ (n 37) 934–5 and 940.
103 ibid 940.
Article 6 CISG is important for present purposes because it reiterates the Convention’s relationship with domestic law. The CISG contains default rules, as its application (being commercial law) is necessarily subject to party will.104 Should they wish, parties may exclude the CISG through a clear and considered choice of law; party autonomy in the private international law sense. Providing that the CISG ‘shall not apply to this contract’,105 or even choosing a State’s law ‘under exclusion of UNCITRAL law’,106 would be sufficient. Where excluded, as a matter of private international law, the CISG is displaced in favour of the otherwise applicable State law. Article 6 CISG is itself part of that law, ensuring this result. As explained in Section C, this operation of the CISG as law is meaningfully distinct from its incorporation as contractual terms.

In practice, some parties to international sales contracts governed by English law already exclude the CISG, notwithstanding its present UK inapplicability. Though there are no comprehensive statistics addressing this phenomenon, Bridge suggests it is ‘routine’ for standard form commodity contracts to ‘invariably exclude the CISG’.107 Such exclusions can be seen in contracts issued by two key international commodity associations—the Grain and Feed Trade Association (‘GAFTA’), and the Federation of Oils, Seeds and Fats Association Ltd (‘FOSFA’). GAFTA contracts 100 and 119, and the FOSFA contracts for Canadian/USA soya beans (CIF terms), and for vegetable and marine oil in bulk (FOB terms), all exclude the CISG, whilst otherwise governed by English law.108 By way of further example, the parties’ choice of law clause in Traxys Europe v Balaji Coke provided:

This contract, including the arbitration clause, shall be governed by, interpreted and construed in accordance with the substantive laws of England and Wales excluding the United Nations Convention on Contracts for the International Sale of Goods of April 11, 1980 (CISG).109

There is practical wisdom in clearly stating things that might otherwise be thought of as going without saying.110 Nevertheless, given that the UK has not yet adopted the CISG, these exclusions are legally unnecessary. In particular, for contracts already formed,111 they do not even protect against future accession, as the CISG’s temporal application is non-retroactive.112 If

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105 This wording is used in clause 29 of the Grain and Feed Trade Association contract number 100—Bridge, The International Sale of Goods (n 19) 636.
111 Standard form contracts could, of course, form the basis of contracts entered into post-accession, were the UK to adopt the CISG.
112 Arts 100(1) and (2) CISG.
traders are already excluding the CISG in contracts governed by English law, UK accession may have little prejudicial impact for those not wishing to be bound. However, accession would open up an additional avenue of choice (within UK law) for traders open to the regime, in the sense that parties could elect not to opt-out of the CISG. At present, UK traders can only adopt the CISG if their contracts are governed by a Contracting State’s law rather than English law—or if they adopt it as contractual terms, which has distinct legal and practical implications.

Since the CISG is itself domestic law when applied to individual sales contracts, Article 6 CISG’s contractual party autonomy powers are not unlike powers already granted under the SGA. The SGA is also largely comprised of default rules, preserving the parties’ right to contrary agreement. Under the SGA, any ‘right, duty or liability’ arising under the Act can be ‘negatived or varied’ by an express agreement, or by a course of dealings, including applicable usages. Such are the parties’ autonomy rights under the SGA, that it is the parties’ contract itself (rather than the Act’s provisions) that tends to be controlling in commodity sales.

E. The Importance of Both Coherence and Competition

This Part’s analysis has demonstrated that the CISG typically applies as part of a broader governing law, its true character being domestic law when applied to particular sales. In this capacity, it interacts with the balance of that State’s law, as a matter of private international law. In the UK context, should the UK accede, the common law, the SGA and the CISG would all work together (subject to the exercise of party autonomy) in regulating international sales.

These aspects of the CISG’s operation may be uncontroversial, but they provide important insights for the UK CISG debate. Should the UK accede, rather than competing with English law, the CISG would become part of English law. Accession would allow merchants to accept the CISG’s operation where their contracts are governed by English law, though would also protect choices of existing non-harmonized English sales law.

Competitive analyses of the CISG and English law are essential in assessing the desirability of UK accession. However, on the basis of this Part’s analysis, coherence emerges as a useful complementary consideration. The focus here is on matters of interaction. If the CISG were adopted, how would it work alongside English law—effectively, or otherwise—in regulating international sales? There is nothing, as a matter of private international law, obstructing the CISG’s effective absorption into English law.

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IV. PHILOSOPHIES OF CONTRACTUAL INTERPRETATION UNDER THE CISG AND ENGLISH LAW

Contractual interpretation methodologies are a well-known point of difference between the CISG and English law. Understanding the CISG as (potentially) part of English law shines a new and useful light on this methodological difference. From a coherence perspective, that the CISG and English law differ is not in itself objectionable; it is given. Differences between State laws create the transaction costs that harmonized law seeks to reduce, and it is in the nature of harmonized law to differ from existing solutions.

From a coherence perspective, analysing each approach’s strengths and weaknesses is not the imperative. Differences in contractual interpretation methodology are important instead because they challenge the CISG’s cultural reception into English law. To this extent, they stand to affect the degree to which the CISG may coherently interface with existing UK sales law.

The common law’s approach to contractual interpretation is objective, and is preserved for sales governed by the SGA. Common law asks ‘what reasonable persons, circumstanced as the actual parties were, would have had in mind’. Recourse to extrinsic materials is controlled. The parol evidence rule also continues to apply at common law, even if significantly qualified in its operation. While its effect can be overstated, the parol evidence rule ‘is not dead, or even ill, but merely misunderstood’—being a rule of construction, rather than evidence, having continuing relevance to modern commercial contracting.

The CISG, on the other hand, does not confine itself to objective assessments of party intention. Pursuant to Article 8(1) CISG, party statements and conduct are to be interpreted according to their intent where the other party knew or could not have been unaware what that intent was. It is only where this

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118 Preamble [3] CISG.
122 Mannai Investment Co Ltd v Eagle Star Life Assurance Co Ltd [1997] 1 AC 749 (HL) 768.
123 Chartbrook Ltd v Persimmon Homes Ltd [2009] UKHL 38, [2009] 1 AC 1101 (HL) 1112 (14) and 1115–1123 (27)–(47).
124 Investors Compensation Scheme Ltd v West Bromwich Building Society [1998] 1 WLR 896 (HL) 913; Prenn v Simmonds [1971] 1 WLR 1381 (HL) 1383 and 1385. See also ibid 1115 [28].
reciprocal knowledge test fails that Article 8(2) CISG provides a (secondary) objective test, though Article 8(1) CISG’s threshold requirements may lead to the objective approach prevailing in most cases. Article 8(3) CISG goes on to explain that, in either case, ‘due consideration is to be given to all relevant circumstances of the case’ including negotiations, practices, usages and subsequent conduct. Recourse to extrinsic materials is expressly permitted in all cases, and despite early United States authority, it is clear that no parol evidence rule applies. Restricting construction to the written document is inconsistent with an interpretative methodology making use of the supporting materials listed in Article 8(3) CISG, and the CISG’s ‘directive’ to admit subjective intent.

These differences may lead to different results. However, more importantly from a coherence perspective, they reflect deeper philosophical differences between the CISG and English law. This was explained by Lord Hoffmann in Chartbrook v Persimmon Homes. Chartbrook reaffirmed the position that pre-contractual negotiations are inadmissible for the purposes of contractual interpretation at common law. Lord Hoffmann explained why English law persists with this tradition, despite the approach of the CISG and other international (and continental) bodies of law, in a passage worth recounting at length:

Supporters of the admissibility of pre-contractual negotiations draw attention to the fact that continental legal systems seem to have little difficulty in taking them into account. Both the UNIDROIT Principles of International Commercial Contracts (1994 and 2004 revision) and the Principles of European Contract Law (1999) provide that in ascertaining the ‘common intention of the parties’, regard shall be had to prior negotiations: [A]rticles 4(3) and 5(102) respectively. The same is true of the United Nations Convention on Contracts for the International Sale of Goods (1980). But these instruments reflect the French philosophy of contractual interpretation, which is altogether different from that of English law … French law regards the intentions of the parties as a pure question of subjective fact, their volonté psychologique, uninfluenced by any rules of law. It follows that any evidence of what they said or did, whether to each other or to third parties, must be relevant to establishing what their intentions actually were. There is in French law a sharp distinction between the ascertainment of their intentions and the application of legal rules which may, in the interests of fairness to other parties or otherwise, limit the

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127 EA Farnsworth, ‘Article 8’ in CM Bianca and MJ Bonell (eds), Commentary on the International Sales Law (Giuffré 1987) 99–100 [2.4]–[2.5].
extent to which those intentions are given effect. English law, on the other hand, mixes up the ascertainment of intention with the rules of law by depersonalising the contracting parties and asking, not what their intentions actually were, but what a reasonable outside observer would have taken them to be. One cannot in my opinion simply transpose rules based on one philosophy of contractual interpretation to another, or assume that the practical effect of admitting such evidence under the English system of civil procedure will be the same as that under a continental system.\footnote{132}

This explanation could be criticized for failing to acknowledge that the CISG (as a whole) embodies a global, rather than purely civilian, perspective. However, the importance of the philosophical differences adverted to by Lord Hoffmann are reinforced by their broader implications. Articles 8(1) and (2) CISG apply to ‘statements made by and other conduct of a party’, including their agreement on contractual terms, but also other conduct such as the acts constituting contract formation.\footnote{133} The common law applies its objective perspective to contract formation.\footnote{134} Further, Lord Hoffmann’s differentiation of factual and legal enquiries reflects differing notions of the contract itself. French law, referenced by His Lordship, subscribes to the maxim \textit{le contrat fait loi entre les parties}—the contract is the law between the parties.\footnote{135} English law instead insists that contracts are contracts only because the law recognizes their binding effect.\footnote{136}

Do these differing philosophies (as opposed to differences in the rules themselves) mean that the CISG is fundamentally incapable of integrating into English law? They may represent a challenge. As the CISG displaces otherwise-applicable State law to its scope’s extent, Article 8 CISG operates to the exclusion of domestic interpretation principles where the Convention applies.\footnote{137} The common law has firmly maintained its approach, based upon policy concerns that admitting subjective intent would cause evidentiary difficulties and uncertainty.\footnote{138} That subjective intent’s primacy ‘would make common law practitioners uncomfortable’ is seen as a major obstacle to the UK’s CISG ratification.\footnote{139} Nevertheless, it is questionable whether the common law’s approach is really all that different from civilian subjective

\footnote{132} ibid 1119–1120 [39]. Although the UNIDROIT Principles 2004 have now been superseded by 2010 and 2016 editions, the interpretative rule referred to remains the same in each. \footnote{133} M Schmidt-Kessel, ‘Article 8’ in I Schwenzer (ed), \textit{Schlechtriem & Schwenzer – Commentary on the UN Convention on the International Sale of Goods (CISG)} (4th edn, Oxford University Press 2016) 144–5 [1]–[3]. \footnote{134} \textit{Smith v Hughes} (1871) LR 6 QB 597 (QB) 607. \footnote{135} See generally J Spigelman, ‘Contractual Interpretation: A Comparative Perspective’ (2011) 85 ALJ 425–6. \footnote{136} \textit{Amin Rasheed Shipping Corp v Kuwait Insurance Co (The Al Wahab)} [1984] 1 AC 50 (HL) 65. \footnote{137} Schmidt-Kessel (n 133) 144 [1] and 145 [3]. \footnote{138} See generally Spigelman (n 135). \footnote{139} cf G McMeel and HC Grigoleit, ‘Interpretation of Contracts’ in G Dannemann and S Vogenauer (eds), \textit{The Common European Sales Law in Context} (Oxford University Press 2013) 371—regarding the Draft Common Frame of Reference and CESL.
approaches, and thus whether these philosophical differences are as wide as might first appear, as reference to objective evidence and objective factors in the ascertainment of subjective intention is necessarily required.\(^{140}\) In addition, CISG accession would have no impact upon contracts governed only by non-harmonized English law—those outside the CISG’s scope, or excluding the CISG. Here, existing common law rules (and their philosophies) would retain their full effect.

Further, any challenge is not insurmountable. The 11th Circuit Court of Appeals in the United States adverted to similar philosophical differences between the CISG and US law.\(^ {141}\) Though the US has had mixed experience with its CISG case law, problems tend to arise around matters of detail, rather than on the basis of philosophical difficulties. One example is seen in the US courts’ initial acceptance of the parol evidence rule under the CISG, referred to above. In a further example, a 2nd Circuit Court of Appeals case recently found an implied CISG exclusion through party reliance on New York law during litigation.\(^ {142}\) Though inconsistent with international understandings of the CISG’s exclusion process,\(^ {143}\) the Court still recognized the CISG’s integration (as a treaty) into federal US law.\(^ {144}\)

English law has previously effectively embraced uniform law. Two UK decisions have referred to the CISG itself as expressing general contractual principles, where it did not otherwise apply.\(^ {145}\) English legislation implementing EU law is interpreted so as to give effect to that EU law, even if involving departure from ordinary English statutory interpretation rules.\(^ {146}\) And in the Fothergill case, the House of Lords was required to interpret the Warsaw Convention;\(^ {147}\) in so doing, it endorsed reference to the instrument’s travaux préparatoires,\(^ {148}\) and also held that the domestic Carriage by Air and Road Act 1979 (UK) (statutorily clarifying an aspect of the Convention’s interpretation from the time of its enactment) could not be used for pre-


\(^ {143}\) CISG Advisory Council, ‘Opinion No 16’ (n 98) 524 [5].


\(^ {145}\) Proforce Recruit Ltd v The Rugby Group Ltd [2006] EWCA Civ 69 (CA) [57]; The Square Mile Partnership Ltd v Fitzmaurice McCull Ltd [2006] EWCA Civ 1690 (CA) [61]–[63].


\(^ {148}\) On both less qualified, and more qualified, bases—see Fothergill v Monarch Airlines Ltd [1981] 1 AC 251 (HL) 283 (Lord Diplock) and 294 (Lord Scarman) (the former); 278 (Lord Wilberforce) and 287–8 (Lord Fraser) (the latter).
enactment claims. Both aspects of Fothergill reflect an internationalist approach to the Warsaw Convention, and similar principles of uniformity and autonomy apply in interpreting the CISG. English law might very well integrate the CISG more effectively than the Warsaw Convention, given that the CISG expressly enshrines internationally-minded interpretative rules within its own text.

Though the CISG and ordinary English law adopt very different interpretative philosophies, they are not necessarily incapable of effectively working together as part of an overall English law of sales. On the one hand, the practical implementation of their philosophies has more in common than first appears. But more fundamentally, from a coherence perspective, just as contracts subject to the SGA are treated differently to those governed only by the common law, contracts governed by the CISG would be treated differently too. Its unique rules (including those addressing contractual interpretation) would apply where the Convention applies—though where excluded, or otherwise inapplicable, the common law would remain as it is today.

V. THE COMMODITIES TRADE, THE CISG, ENGLISH LAW AND TRADE TERMS—COHERENT COMBINATION?

Part III demonstrated the benefit of a coherence perspective on the UK CISG debate. Part IV applied this perspective to issues of contractual interpretation. It can also usefully be applied to other issues across the UK CISG debate.

One of these is the hotly contested commodities trade topic. English law has played a significant role in developing the commodities trade, while the CISG’s capacity to regulate commodity sales is consistently critiqued in existing competitive literature. Fundamental breach is an exemplar point; English sales law (in comparison) is ‘much more receptive to avoidance’.

This paper’s coherency perspective asks a complementary question: can a state of English law, incorporating the CISG as one element, effectively serve commodity merchant needs? As trader needs are key to this analysis, the trade’s characteristics must be kept in mind. Commodity markets involve volatile prices, speculation and futures contracts, and also string sales. Ultimate sellers and buyers at each end of a string deal in physical goods, while traders in between effectively undertake ‘not a trade in goods but in contracts’.

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149 ibid 271 (Lord Wilberforce), 288 (Lord Fraser) and 302 (Lord Roskill).
151 Art 7(1) CISG.
152 Vogenauer (n 140) 125–9.
153 Zhou (n 32) 672.
154 See, eg, Treitel (n 36) 1163–5 [18-004].
155 See, eg, Bridge, ‘Avoidance for Fundamental Breach’ (n 37) 931.
156 ibid 917.
for the shipment of goods’. The documentary (and largely standardized) basis of sales, combined with volatile prices, mean that great importance is placed on conforming documents as well as timeliness—‘August wheat, for example, is not the same commodity as September wheat’. All in all, legal certainty is highly valued.

A. The CISG and English Law—An Exercise in Altering Default Rules

Future CISG accession would leave the UK’s existing body of sales law intact. Both the common law of contract and the SGA would remain capable of regulating commodity sales. Accession would only alter the UK’s default rules for international sales. This goes to the heart of the coherency perspective’s application to commodity sales, and the party autonomy considerations which are key to this analysis.

Given Articles 4 and 7(2) CISG, the Convention’s default application would not completely exclude ordinary English sales law. Parties to an international sales contract wishing to adopt non-harmonized English sales law could also still achieve that result, by opting out using their private international law party autonomy rights under Article 6 CISG. Similarly, Article 6 CISG’s contractual autonomy powers allow parties to modify particular parts of the Convention felt problematic. English law is a popular choice of law for international contracts, and for commodity sales in particular. Article 6 CISG (as part of English law) would ensure that non-harmonized English law remains a viable choice for traders preferring its more hard-nosed legal regime. The words required for CISG exclusion are “generally well known”, and as Part III demonstrated, contracts governed by English law already tend to exclude the CISG.

Article 6 CISG’s very existence, and its place within English law (upon future accession), underscore the Convention’s sophisticated default operation within broader bodies of State law. At the same time, the Convention is far from irrelevant, notwithstanding Article 6 CISG and its protection of both private international law and contractual party autonomy. Empirical evidence assessing routine CISG exclusion varies; automatic opt-outs are risky for lawyers from a professional liability perspective; and the CISG’s application may have real advantages in the manufactured goods trade.

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160 See, eg, ibid 22–3.
161 Bridge, ‘Avoidance for Fundamental Breach’ (n 37) 931.
163 Bridge, ‘Avoidance for Fundamental Breach’ (n 37) 931.
164 Spagnolo, CISG Exclusion (n 99) 98.
165 Spagnolo, ‘The Last Outpost’ (n 100) 160; see generally 160–2.
166 ibid 163–5.
Alongside fundamental breach, the CISG’s interaction with trade terms is an ongoing point of contention in the literature’s commodity-specific analysis. Being a matter of interaction, this issue can usefully be considered from a coherence perspective.

Both the SGA and the CISG support adoption of trade terms, such as CIF (cost, insurance and freight) and FOB (free on board), being common features of the commodities trade. Trade terms are shorthand references to bundles of rights and obligations surrounding particular legal issues including transport formalities, cost allocations, insurance, delivery and risk. They are not themselves comprehensive contracts. Trade terms are given meaning according to their context, with meanings deriving from both the common law and the International Chamber of Commerce’s Incoterms 2010 publication. It is therefore necessary to address how the SGA and the CISG accommodate trade terms as understood in both senses.

This issue is already canvassed in the literature, but from a competitive starting point—a perspective seeking to establish the relative superiority of one regime over the other. The coherency-focused question asked by this article, instead, is: would a state of English law, inclusive of the CISG, secure effective co-existence and interaction between all three of the SGA, the CISG and trade terms of any kind? Misgivings as to the CISG’s ability to accommodate trade terms, evident in competitive literature, are clarified by a careful coherency analysis, and a consideration of contractual party autonomy—key themes underpinning this article.

Though trade terms are common in commodity sales, views differ as to the frequency with which common law and Incoterms trade terms are adopted. In any event, though the SGA and the CISG both contain default rules for typical legal issues addressed by trade terms, both also respect contractual party autonomy’s primacy. Both have the potential to interface effectively with chosen trade terms of either kind, as well as each other (and the common law), in regulating commodity contracts.

The SGA’s position is conceptually simple. The SGA, section 55(1) permits negating or varying rights, duties or liabilities implied by the Act, and the SGA’s provisions governing typical trade term issues individually identify themselves as subject to contrary agreement. This is seen, for example, in the SGA, section 20(1) regarding risk passing, sections 29(1) and 29(2)
regarding delivery\textsuperscript{172} and sections 32(2) and 32(3) regarding carriage and insurance.

The contrary agreement envisaged by these provisions could involve parties adopting either common law or \textit{Incoterms 2010} trade terms. Where sales contracts are governed by English law, as a matter of private international law, trade terms are given their common law meanings absent indication to the contrary, and English case law substantially fleshes out the SGA’s application to commodity sales through the meaning given to trade terms.\textsuperscript{173}

Should parties wish to adopt an \textit{Incoterm} into a contract governed by English law, they can also do so, though should clearly express their intention to adopt its \textit{Incoterms} meaning. A reference to FOB or CIF in itself, given the broader English law context, is unlikely to suffice. \textit{Incoterms 2010} gives as suggested wording ‘[the chosen \textit{Incoterms} rule including the named place, followed by] \textit{Incoterms® 2010}’\textsuperscript{174} As opposed to bare FOB or CIF notations, wording of this kind would unambiguously and objectively demonstrate an intention to adopt a term’s \textit{Incoterms 2010} (rather than common law) meaning. An Australian example, \textit{Onesteel Manufacturing v Bluestone Steel}, involved parties adopting the \textit{Incoterms 2000 DEQ} trade term in a contract otherwise governed by the Sale of Goods Act 1923 (NSW), and the Australian common law.\textsuperscript{175} This example is particularly pertinent evidence of the ability to combine \textit{Incoterms} and the SGA, given that the Sale of Goods Act 1893 (UK) is the model upon which the New South Wales legislation is based. Interestingly, the DEQ term used in this case made no specific reference to \textit{Incoterms}. Its interpretation as an \textit{Incoterm} was probably affected by the particular term chosen;\textsuperscript{176} though ‘ex quay (port of arrival)’ is recognized at common law,\textsuperscript{177} the DEQ notation is a creature of \textit{Incoterms} itself.

Contrary to commentary suggesting otherwise,\textsuperscript{178} adopting trade terms creates no difficulty under the CISG either, leading to a conclusion that the SGA, the common law, the CISG and trade terms could all coherently interact. It is true that the CISG does not ‘specifically’ deal with trade terms,\textsuperscript{179} lacking express mention of CIF terms, FOB terms or other commonly used trade terms.\textsuperscript{180} It is nevertheless well equipped to support

\begin{thebibliography}{99}
\bibitem{172} cf Sale of Goods Act 1979 (UK), sections 29(3) and (3A); Consumer Rights Act 2015 (UK), section 28.
\bibitem{174} International Chamber of Commerce, \textit{Incoterms 2010} (n 86) 5 (emphasis altered).
\bibitem{175} \textit{Onesteel Manufacturing Pty Ltd v Bluestone Steel (AIS) Pty Ltd} (2013) 85 NSWLR 1 (NSWCA) 9 [25].
\bibitem{176} cf. Bridge, \textit{The International Sale of Goods} (n 19) 526–7 [10.62].
\bibitem{177} R Burnett and V Bath, \textit{Law of International Business in Australasia} (The Federation Press 2009) 76.
\bibitem{178} Treitel (n 36) 1164–5 [18-004].
\end{thebibliography}
their use. Though Article 9(1) CISG binds parties to any 'usage' agreed, and Article 8(3) CISG recognizes ‘usages’ as extrinsic evidence to be used in interpreting contracts and party conduct, it is acknowledged that whether or not trade terms constitute usages is contentious. For this reason, Incoterms should not necessarily be considered automatically applicable to commodity sales only by virtue of Article 9(2) CISG. Nevertheless, even aside from Articles 9(1) and 8(3) CISG, trade terms are accommodated by Article 6 CISG, and its preservation of contractual party autonomy.

The CISG’s capacity to accommodate trade terms is not dissimilar to its affinity with arbitration. The Convention is well suited to application in arbitration, despite arbitration only being fleetingly referred to in its text. Both cases prioritize substance over form. The Convention provides a ‘general background’, and successive iterations of Incoterms are said to represent its ‘fine-tuning’. The same can also be said for trade terms defined at common law.

When the CISG forms part of the applicable law, Article 6 CISG in particular is part of that law. With the Convention comprising default rules, Article 6 CISG confirms its ‘dispositive’ nature, allowing parties to exclude it as a whole, or exclude or vary the operation of particular provisions. The latter (contractual) forms of party autonomy have been discussed in the UK CISG context, with Bridge suggesting UK merchants might consider varying the fundamental breach test if otherwise bound by the Convention. Like the SGA, the Convention contains a number of provisions addressing legal issues also dealt with by trade terms. When adopting trade terms, including Incoterms, parties contractually vary the CISG’s particular provisions relating to delivery, risk and other relevant aspects of their rights and obligations. They vary the governing law’s effect through agreement, just as they would by adopting common law trade terms in an SGA contract.

It has been queried whether this is ‘too elliptical a way’ to exclude these provisions, and suggested that ‘a contractual reference to FOB or CIF surely is not clear enough to carry conviction with a tribunal’. Nevertheless, this is indeed the result (providing intention to adopt a term’s Incoterms meaning

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182 See, eg, Treitel (n 36) 1164 [18-004].
185 PP Viscasillas and DR Muñoz, ‘CISG & Arbitration’ in A Büchler and M Müller-Chen (eds), Private Law: National – Global – Comparative (Intersentia 2011) 1355. See arts 45(3) and 61(3) CISG.
186 cf Gabriel (n 180) 44.
187 Schwenzer and Hachem, ‘Successes and Pitfalls’ (n 181) 477.
189 cf Bridge, ‘Avoidance for Fundamental Breach’ (n 37) 934–5 and 940.
190 See, eg, arts 30–34, 53, 60 and 66–70 CISG.
191 Schwenzer and Hachem, ‘Successes and Pitfalls’ (n 181) 476–7.
192 Bridge, ‘A Law for International Sales’ (n 14) 38.
is clear), as adopting an *Incoterm* is an incorporation of that term’s 20 individual clauses into the parties’ contract by reference. Rather than being elliptical, those clauses actually define party obligations ‘with considerable precision’.

Though the CISG does not contain specific rules addressing the incorporation of standard terms, this result is reached by applying the Convention’s ordinary contract formation provisions to the standard terms context. When parties adopt trade terms, Article 6 CISG ensures that these contractual provisions take primacy over the Convention’s default rules. Though admittedly making the CISG’s ‘extensive treatment of risk … a rather pointless business’ in commodity sales, it does not necessarily follow that this is inconsistent with the instrument’s intent. The Convention’s risk provisions retain an important scope for operation in the manufactured goods trade, where trade terms are not necessarily at play. Trade terms (alongside associated case law) substantially displace the SGA’s risk provisions as well.

What if the UK adopted the CISG, but parties to an international sale sought to adopt common law trade terms? As the UK is not yet a Contracting State, case law demonstrating the effectiveness of such choices does not currently exist. Nevertheless, the CISG would (in principle) interface effectively with common law trade terms. Trade terms are ordinarily given meaning by the common law because English law is governing; this would still be so following UK accession. Though impossible to say with absolute certainty in the abstract, reference to FOB or CIF may import (without more) those terms’ common law meaning, even in a CISG contract, given the overall English law context. This is not the result of Article 7(2) CISG, an analysis fairly critiqued in the literature, but of parties once again exercising Article 6 CISG contractual autonomy rights. Deference to contractual party autonomy is a general principle of the Convention. The key question in any particular case would be whether (typically on an objective basis) relevant intent exists.

Nevertheless, Professor Treitel adverts to two potential difficulties. First, Treitel questions the Article 6 CISG implications of adopting common law trade terms. Would adopting CIF or FOB terms (as understood at common law) completely exclude the CISG, where English law is applicable? That is, would such adoption amount to an exercise of private international law, rather than only contractual, party autonomy? Secondly, Treitel queries

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194 Burnett and Bath (n 177) 77.
197 cf Bridge, ‘A Law for International Sales’ (n 14) 38.
198 ibid 38–9.
201 Treitel (n 36) 1164 [18-004].
whether the English conception of CIF or FOB trade terms might constitute practices or usages relevant to contractual interpretation pursuant to Article 8(3) CISG;\textsuperscript{202} a matter adverted to above. Both concerns highlight the importance of critically analysing the CISG’s application as part of an overall English law for commodity sales, the focus of this article’s coherency perspective. On such analysis, both concerns can be resolved.

As to the first, an affirmative and deliberate decision is required to exclude the CISG as a whole.\textsuperscript{203} Trade terms are not comprehensive contractual arrangements; their adoption cannot properly constitute this decision. Adopting trade terms would derogate from the Convention’s individual provisions governing trade term issues. However, this is the very point of adopting trade terms, of any kind. The CISG’s default rules on delivery, risk and other related issues are displaced in favour of rules specifically chosen by the parties; if it were otherwise, the very concept of trade terms would be redundant.

As to the second concern, this would be a potentially legitimate application of Article 8(3) CISG, if warranted by the circumstances of a particular case (as where common law trade terms are specifically chosen). Nevertheless, it is more likely that Article 6 CISG would give effect to the parties’ adoption of trade terms. Article 8(3) CISG is part of the Convention’s contractual interpretation toolkit. The circumstantial matters referred to are extrinsic sources that reference may be had to in interpreting the parties’ contract. They are not a direct source of rights and obligations. As explained in Part III, it is only where there is a gap in the CISG and where English law is governing that the common law would supplement the Convention’s rules. The CISG does itself contain default rules for legal issues addressed by trade terms at common law.

C. The SGA, the CISG and Trade Terms—Effective Substantive Interaction?

Turning now to those rules, much commodities-related criticism of the CISG has been directed at its contents.\textsuperscript{204} This is squarely competitive analysis. Adopting a coherence perspective, we can also usefully ask: can the SGA and trade terms work effectively alongside the CISG, in regulating commodity contracts, as a matter of substance? This question admittedly blurs the line between coherence and competition, and it is not the purpose of this article to retread what is already well-covered ground. However, this article does not suggest that either perspective is superior, or that they are mutually exclusive. Both are legitimate and useful considerations in assessing the desirability of UK CISG accession. To the extent that overlap is evident in

\textsuperscript{202} ibid.
\textsuperscript{203} CISG Advisory Council, ‘Opinion No 16’ (n 98) 524 [3]–[5].
\textsuperscript{204} See, eg, Bridge, ‘The Transfer of Risk’ (n 90).
this section, their complementary natures—identified in Part II of this article—are recognized.

There are strongly held opposing views about the CISG’s suitability for commodity sales, in existing competitive literature. One view argues that the CISG’s contents are not well suited to commodity contracts. The right to cure defective documents has attracted criticism,\(^\text{205}\) as has fundamental breach.\(^\text{206}\) The fundamental breach test—classifying breaches, rather than terms—necessarily implicates uncertainty. This can be contrasted with the common law, where key obligations around timeliness and documentation are conditions\(^\text{207}\)—in the commodities trade, speed and certainty are paramount.\(^\text{208}\) The opposing view argues that the CISG is well suited to govern international sales of any kind, as its operation can adapt to the requirements of particular contracts—if not by virtue of a flexible text,\(^\text{209}\) through contractual party autonomy, and the adoption of *Incoterms* trade terms.\(^\text{210}\)

These arguments illustrate the deadlock resulting from existing analyses. This article’s coherence perspective—focusing on the interactions between the SGA, the CISG and trade terms—supports UK adoption of the CISG. It would be tempting to simply rest this conclusion upon Article 6 CISG’s respect for private international law party autonomy—that since parties can exclude the CISG, it is *unnecessary* to evaluate its substantive provisions. Instead, it reaches a more moderate conclusion, falling somewhere in between the existing opposed views. This conclusion is supported by analysing delivery, and the passage of risk, under the CISG. Though not the only targets of commodity critique, they are legal issues of particular significance to the commodities trade, and are focal points of the commodities controversy.\(^\text{211}\)

Professor Bridge has undertaken a rigorous analysis of the complexities of the CISG and SGA’s rules on delivery and risk, with reference to both common law and *Incoterms* trade terms. Bridge concludes that the CISG’s provisions are ‘far from exemplary’ in their ‘mesh’ with trade terms, and argues that they do not ‘capture the central ground of sales practice’ by failing to embody rules ‘from which the parties depart in only a minority of cases’.\(^\text{212}\) Bridge identifies several ways that the CISG’s rules—in isolation, and when coupled with trade terms—embODY failings in light of commodities practices. Given the importance of commercial reality, there is much force in this analysis, from a competitive point of view.

From a coherence perspective, however, Bridge’s analysis might instead support this article’s more moderate conclusion. On a close examination,
some of the CISG’s identified failings are also seen in the SGA. With respect to other problematic issues, the Convention’s operation can be recalibrated along more commercially feasible lines through the adoption of trade terms. While it is not the role of this article to compare the merits of the CISG and SGA’s rules, these conclusions demonstrate that the CISG can effectively interact as part of an overall English law of sales. From a coherence perspective, this section’s analysis is therefore inherently connected with that in Section B. It is exactly to the point that the CISG can coherently integrate trade terms, when addressing its delivery and risk rules in the commodities context. Trade terms represent commercially reasonable solutions to problems that might not otherwise arise where manufactured goods are involved, where the CISG’s own text has greater scope for application. The issue ultimately comes down to the SGA, CISG and trade terms’ interactions—and party autonomy powers to choose amongst them.

Article 66 CISG confirms the effect of risk passing, in that loss or damage to goods occurring after that time does not discharge the buyer from its obligation to pay the price. Since responsibility for deterioration is allocated by general contractual risk, rather than by Part III, Chapter IV of the CISG, Bridge points out that a buyer examining goods upon arrival ‘may … have to face the difficult question of determining whether any non-conformity in the goods was due to the seller’s non-performance or was due instead to a risk event that occurred in the course of transit’. Bridge points out that in some factual circumstances, as in the Mash & Murrell case, this is a difficult practical problem for a buyer.

Nevertheless, as Bridge also points out, this same difficulty is encountered under the SGA. The Mash & Murrell decision is itself an English case, decided under the Sale of Goods Act 1893 (UK). Bridge commends the ‘practical wisdom’ in buyers and sellers agreeing upon a binding, independent examination process where goods are handed to a carrier, particularly for commodities transactions where goods can be ‘adequately examined in a superficial manner’. To the extent that commodity market needs justify departure from the CISG’s default rules here, a similar departure is also required from the SGA, and the parties’ agreement would be respected in both cases.

Article 67(1) CISG addresses risk where goods are to be carried, providing that risk passes when goods are handed over to the first carrier. By way of exception, where the contract requires goods to be handed to a carrier at a particular place, risk passes when the goods are handed over at that place. Though Article 67(1) CISG refers to handing over the goods, not delivery,
Article 31(a) CISG independently uses that same act to define the delivery obligation. Bridge critiques Article 67(1) CISG as ‘wholly unsuitable for certain long-established shipping terms used in international sales transactions’, being ‘particularly . . . FOB and CIF contracts’. Bridge casts some doubt as to whether adopting a trade term would constitute an Article 6 CISG contractual derogation from the Convention’s risk provisions, and concludes that in any event ‘there is something unsettling about a rule that is as detached from commercial practice as this one’. Bridge also critiques Article 67(1) CISG’s inconsistency with risk passing at the ship’s rail, now adopted in several Incoterms 2010 trade terms, which has ‘the great merit of visibility’ and which makes commercial sense where loose commodities (like wheat and oil) are incrementally loaded. Elsewhere in the literature, Bridge has criticized Article 67(2) CISG, where ‘[n]evertheless’ risk does not pass ‘until the goods are clearly identified to the contract’; problematic where commodity traders sell part of a cargo, though cannot identify exactly what part was sold.

Bridge’s criticisms of Article 67(1) CISG come to two points—that it does not embody the rule most suitable for commodities trading, and that it would not effectively interface with chosen trade terms that otherwise are. These points—also encompassing Bridge’s criticism of Article 67(2) CISG—come back to the issues of interaction and party autonomy, addressed in Section B. As to the first, in addition, it is unsurprising that the CISG does not reflect solutions entirely optimal for commodities contracts in absolutely all respects. The CISG embodies default rules intended to apply to all kinds of sales, including commodity sales, and also sales of manufactured goods.

As Bridge has elsewhere concluded, the CISG has ‘a great deal to commend it’ for manufactured goods sales. Even there, its application is not perfect—for example, the strictness of fundamental breach raises the practical possibility of sellers ‘forc[ing] severely non-conforming goods on an unwilling buyer’. But no body of law is perfect, and merchants will ultimately exercise their private international law party autonomy rights to adopt the law felt best suited to their transactions, and their contractual autonomy rights within the limits allowed by that law. This could include allowing the CISG’s default rules to apply, in appropriate cases, if such application is available.

As Bridge acknowledges, the general policy of buyers bearing transit risk is sound, as ‘it is better to give the buyer as the person on the spot the task of determining what has happened to the goods in transit’. Article 67(1)
CISG is at least consistent with this general policy; commonly chosen trade terms can readily adjust the exact moment risk passes, if required. Though Bridge suggests that the Convention’s default rule does not correspond to commercial practice,\(^ {227}\) the more important point from a coherence perspective is contractual party autonomy. Commodities contracts adopting no trade term of any kind (displacing this default rule) would be unusual.

Article 68 CISG addresses risk where goods are sold in transit. Risk passes upon contracting, or retrospectively (if indicated by the circumstances) when the goods were earlier handed over to the carrier. Risk remains on the seller if they knew of loss or damage at the time of contracting. Bridge points out that Article 68 CISG is ‘silent’ on cases where the chosen trade term provides that risk does not pass until goods arrive at their destination.\(^ {228}\) More fundamentally, Bridge critiques this provision for its division of transit risk between sellers and buyers, and its retrospective allocation of risk in circumstances that are not clearly defined, where Articles 6 and 9 CISG could have secured this same result.\(^ {229}\)

As to Article 68 CISG’s relationship with trade terms causing risk to pass at arrival, this is exactly the kind of clear derogation that Article 6 CISG respects, and that would displace the Article 68 CISG default rule. The very omission referred to by Bridge illustrates the CISG’s receptiveness to ‘fine-tuning’\(^ {230}\) by trade terms, of common law or *Incoterms* origin, and thus its ability to integrate into an overall English sales law regime. Consistently with commercial expectations,\(^ {231}\) contractual party autonomy prevails.

As to Articles 6 and 9 CISG already having the capacity to secure retrospective risk transfers where agreed (or where usage requires), Article 68 CISG’s restatement is not so different to similar restatements seen in the SGA. Once again, the point here is not to show the necessary superiority or inferiority of either regime, but that they may both form part of a workable system. Under the SGA, section 55(1), the parties’ power to reach their own agreement (contrary to the Act’s default rules) is confirmed. Nevertheless, the SGA is otherwise replete with provisions individually recognizing their application as subject to contrary agreement. For example, risk passes with property unless otherwise agreed;\(^ {232}\) the primary rule regarding delivery refers to the parties’ contract;\(^ {233}\) and it is only absent contractual stipulation that the SGA fixes the place of delivery.\(^ {234}\) The main difference here is that the ‘circumstances’ referred to in Article 68 CISG may include circumstances short of agreement,

\(^{227}\) ibid 87. \(^{228}\) ibid 94. \(^{229}\) ibid 95–6.  
\(^{230}\) Schwenzer and Hachem, ‘Successes and Pitfalls’ (n 181) 477.  
\(^{233}\) Sale of Goods Act 1979 (UK), section 29(1).  
\(^{234}\) ibid section 29(2).
such as the presence or availability of insurance. On the other hand, those circumstances would certainly include party agreement, if such agreement is reached.

Finally, regarding the division of transit risk (and the retrospective passage of risk in general), these rules are admittedly more complex than the SGA’s position that risk passes with property. However, complex risk rules are inevitable where the Convention does not itself deal with property’s passage. This is a limitation of the CISG; and given that harmonizing property rules was considered too difficult a task, it illustrates a limitation of treaties themselves. Nevertheless, Bridge acknowledges that even under existing English law, risk rarely passes with property in actual practice, given the widespread use of retention of title clauses. Elsewhere in his work, Bridge suggests that the CISG exemplifies a ‘trend’ in more closely aligning risk with delivery that ‘accords with international sales practice’. As Bridge also points out, there is often no genuine delivery of goods in commodity sales, delivery instead being of documents, where intermediate commodity sales occur in-transit along a string between ultimate sellers and buyers. In this sense, these risk rules’ complexity may not be as problematic as first appears, when situated within the broader context of English law.

In relation to Article 67(1) CISG, Bridge gives an example involving a CIF contract, pertinent to the present analysis of Article 68 CISG. In that example, a notice of appropriation is given after shipment, and having risk pass during the voyage may be inconsistent with commercial expectations given the risk of incremental damage from sea water. This example demonstrates that retrospective risk passage, in appropriate circumstances (to which Article 68 CISG refers), might be a commercially realistic solution. In exercising their private international law and contractual party autonomy rights, it is ultimately commercial parties who would decide whether this is so.

Problems with the CISG’s delivery and risk provisions, in the commodities trade, should be understood in context, where the Convention’s potential interactions with English law are concerned. This context, and this article’s coherency analysis, provide an informative (and more hopeful) complementary perspective to the literature’s existing competitive view.

236 cf ibid 981 [8].
238 UNCITRAL Secretariat (n 83) 17 [4].
239 Bridge, ‘The Transfer of Risk’ (n 90) 77.
240 ibid.
241 ibid 94.
242 ibid 90–1 and 97.
243 cf Bridge, ‘Avoidance for Fundamental Breach’ (n 37) 913—‘complexity breeds expense’.
244 Bridge, ‘The Transfer of Risk’ (n 90) 93–4.
This Part has demonstrated that both the SGA and the CISG accommodate the use of trade terms, sourced from both the common law and Incoterms 2010. Both also accommodate each other, and share more in common than may initially be apparent. If the UK were to accede, the SGA and the common law would fill the CISG’s gaps. The CISG in turn accommodates existing English sales law by recognizing private international law party autonomy rights to exclude the Convention, and contractual party autonomy rights to exclude or modify particular provisions.

From a coherency perspective, the CISG can operate effectively as part of an overall English commodity sales regime. Rather than being fundamentally incompatible with English law or the commodities trade, the CISG would represent one feature of English law open to parties’ consideration when making choices of law. UK accession would open up an avenue of choice for merchants wishing to adopt the CISG, in the sense that they may allow its default rules to operate if desired (as opposed to incorporating its provisions as contractual terms). For those not wanting to do so, their power to exclude its operation would be protected by law.

VI. CONCLUSION

Though the Convention is over 35 years old, debate surrounding the UK and its position on the CISG continues. CESL’s short-lived threat reawakened interest in this problem, and the UK’s impending EU exit once again presents an opportunity to ask whether its interests would be served by accession. Existing analysis has rightly focused on practicalities, by way of competitive analysis. This is appropriate, and essential, having the needs of merchants at its heart. Nevertheless, it has failed to secure a definitive view. This article argues for the CISG’s UK adoption through an also-useful, and complementary, analysis—based on coherence. From this point of view, accession is not about having one body of law or the other, but whether there can be one body of law and the other.

There are real advantages in applying non-harmonized English law to international sales. It has a particular reputation as being hard-nosed and certain—evidenced in its receptiveness to termination. Several foundation common law contract cases—the mainstay of English contract textbooks—have involved parties using English law as a weapon in commodity markets. As explained by Bridge, ‘[t]he commercial logic …
is that sellers exercise termination rights on rising markets and buyers on falling markets’. Nevertheless, from this article’s coherency perspective, the issue is less about certainty, and more about freedom—merchants’ party autonomy rights to choose their governing law, and to shape their contracts as they see fit.

Merchants already exclude the CISG in commodity contracts governed by English law. The CISG does not yet apply in English law, and future accession cannot retrospectively make it apply to contracts already concluded. The requirements for opting out are well known, and are already being employed. Little prejudice would be suffered by merchants who do not wish to be bound by the CISG, were the UK to accede. Assuming a minimal level of merchant sophistication, additional transaction costs (and the time required for adjustment) would be negligible. This is an important observation when reflecting on the reality that international instruments necessarily have ‘at least some measure of departure from cherished legal traditions’; with the question being ‘how extensive will the sacrifice have to be before … fatal … to treaty accession’.

For merchants wishing to contract on the Convention’s terms, accession would grant them the opportunity to do so, whilst also being supported by the balance of English private law. At present, English (or foreign) traders can only take advantage of the CISG if their contracts are governed by the law of a non-English, Contracting, State—or if their contracts adopt the CISG in and of itself, which may have distinct legal and practical implications. For this avenue of choice to work in practice, merchants would need to understand the CISG, its benefits and limitations. As put by Bridge, ‘[a] brief practical guide about some of the pitfalls in the CISG, and about some of the choices that contracting parties might want to make, would have much to commend it’. Given that commodity sectors tend to be relatively well organized, commodity trade organizations would be a good place to start.

Over more than 35 years, the CISG has grown in significance, while the UK has remained cautious. Abstaining from accession even now prevents the UK from helping shape (from the inside) what is becoming a global law of international sales. Consider the view of Barry Nicholas in 1993:

Now that the Vienna Convention is in force and, more importantly, now that it has been ratified by the United States and other common law countries and by our main trading partners in the European Community, can the United Kingdom afford to remain outside?

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248 Bridge, ‘A Law for International Sales’ (n 14) 27.
249 ibid 18.
250 Bridge, ‘Avoidance for Fundamental Breach’ (n 37) 940 n 142.
At that time, the CISG’s Contracting States were not nearly as numerous as they are now, and the CISG has since become an expression of customary international trade law.\(^\text{253}\) This article’s coherency analysis demonstrates that adopting the CISG is consistent with merchant interests. Even aside from any desire (or lack thereof) from the UK’s legal and trading communities, accession would also be a matter of good governance. The UK must become a Contracting State to help shape the Convention’s dynamic interpretation.\(^\text{254}\) And while the ongoing Brexit process marks a break with EU coherence, adopting the CISG would allow the UK to secure coherence with all 89 States currently signatory to the Convention. In a private international law environment characterized by Brexit’s ‘considerable uncertainty’,\(^\text{255}\) uniform private law is a ‘way to attack the choice of law problem at its root’.\(^\text{256}\) Accession would also allow English law to supplement the CISG, not currently possible as a matter of private international law.

The DTI recognized this in 1997, when the number of CISG ratifications had doubled, and it expressed concern that the UK would isolate itself, disadvantage its traders and rob its courts of the opportunity to help shape the Convention.\(^\text{257}\) That was over 20 years ago, and the justifications for UK accession are as relevant today as they have ever been.

Existing competitive analyses demonstrate that resolving the UK CISG debate is not easy. However, additional insights can be obtained by considering the coherency perspective advocated by this article. An exploration of coherency and private international law shows there is room for the CISG in the UK legal system. The United Kingdom would serve the interests of its traders, and its public policy, by accession as a Contracting State.


\(^{254}\) Goode, ‘Insularity or Leadership?’ (n 2) 756.


\(^{257}\) Department of Trade and Industry, A Consultation Document (n 16) [22]–[23].
Chapter 2: What is a smart contract?

Question 1

Please share your views below:

The use of computer programs to manage contractual obligations is becoming more common. While not all contracts can be automated, there are many that do not require human interaction to function properly. For example, if two people sign a contract for the sale of goods at a price agreed upon by both parties, it would be possible for one party to automatically make payments when they are due using an online banking service or credit card company. This process does not need human intervention.

Question 2

Please share your views below:

Smart contracts do not require blockchain or DLT to operate, but can be deployed using centralized, in-house systems. This has already been done by the US commodities firm, S&P Global Platts. The extent to which these contracts are mere automated contracts and thus ought to be scrutinized in terms of centralized forms of automation rather than as distributed or autonomous contractual agents, needs to be considered. But this may disqualify non-DLT or non-blockchain-based "smart contracts" from a more focused analysis and consideration of the effects of contracts deployed expressly via DLTs.

Question 3

Please share your views below:

Permissioned systems maintain "in-house" levels of oversight in terms of security, access, governance, and efficiency. Permissioned DLT systems are no de facto closed systems, but they do provide organisation, institutions, etc., with a gatekeeping option over data and information integrity.

Permissionless systems maintain many of the same facets outlined above but rely upon community consensus protocols rather than governance board style protocols. This makes permissionless systems flexible and agile, but equally, more turbulent, vulnerable, and susceptible to influxes of erroneous, inaccurate, fraudulent, or corrupt data and information ("rubbish in / rubbish out").
Question 4

Solely code contract

Please provide examples of how these forms of smart contract have been used in practice:

A coded smart contract is a machine-readable program which executes automatically when certain conditions are met. The most commonly used existing smart contracts in development are coded, and these execute automatically once the conditions have been met. There are many different types of coded smart contracts that can be created. One example of a type of contract is an escrow contract. A coded smart contract offers the process of transferring data or tokens between two parties that can be executed without third-party verification. A coded smart contract requires some level of trust between both parties and usually involves digital signatures and cryptographic hashes to verify transactions. Smart contracts can be used to represent any sort of contractual obligation, but their most common use cases involve things like crowdfunding agreements and financial instruments such as loans or shares.

Question 5

Please share your views below:

A hybrid smart contract is a form of blockchain technology that incorporates natural language and code to create a more robust, streamlined agreement. What are the benefits of this new type of contract? The advantages of using hybrid contracts are significant. For one thing, they make it much easier for people without extensive programming knowledge to write and review smart contracts by incorporating natural languages into the code. This means there's less need for developers to translate agreements from English into something like Solid. Hybrid smart contracts can bridge this gap by leveraging natural language processing techniques that make code readable and accessible to humans without compromising security or immutability. The main advantages of smart contracts over traditional contracts include eliminating the need for intermediaries to verify contract terms, executing and enforcing obligations automatically (i.e., instantaneously), reducing transaction costs, increasing trust between contracting parties due to the immutable nature of distributed ledgers, etc. Hybrid contracts combine code, natural languages, and blockchain technologies in order to provide an easy-to-understand contract while also having a digital record of the agreement on the blockchain. The key idea behind hybrid contracts is that they can be understandable by people who may not know any programming languages or law vernaculars and, therefore, they have immense commercial and consumer potential.

Question 6

Please share your views below:

A natural language agreement, also known as a "plain English" agreement, is a contract written in human-readable terms. A code only contract would not include any wording at all. The parties are instead relying on the code to perform their obligations under the contract. There are many different ways to negotiate and draft an agreement with a counterparty for either of these types of contracts. However, one consideration is whether or not you intend for there to be a hybrid contract. In the event that a smart contract is being drafted, it is important to identify whether or not there will be any hybrid contracts or code only contracts. A hybrid contract would involve a natural language agreement with an embedded computer code which will perform the obligations set out in the natural language agreement. A code only contract involves writing down all of the contractual obligations and embedding them into computer codes to carry out those obligations without any accompanying documentation written in natural languages.

The process of negotiating, drafting and entering into a smart contract can be different depending on the agreement, therefore. If all the contractual obligations are contained in a natural language agreement and the code is intended merely to perform those obligations, then there will be no negotiations or need for drafting because both parties have agreed to this already. The practical steps involved in coding the parties’ rights and obligations contained in the natural language agreement include compiling legal documents from multiple sources (such as agreements signed by both parties).

Question 7

Please share your views below:

There are many use cases for smart contracts which are being developed, at proof-of-concept stage or already operational. One example is the Corgi contract—a proof-of-concept DApp. This contract would release tokens to an investor who purchased it on a platform such as Ethereum. The tokens are locked in until either one party agrees to release them (this could be either the investor or company) if certain conditions have been met. The project utilises Ethereum’s public blockchain to allow brands to distribute digital content via branded tokens, or “corgi”. The objective of this contract is to allow users to buy and sell “Corgis” (the name given to the tokens) on a decentralized exchange with other token holders without any intermediaries such as cryptocurrency exchanges.

Question 8

Please share your views below:

There are many benefits and cost savings that can be achieved with smart contracts, but there are also costs to the increased use of these types of contracts. One of the most significant benefits is reduced risk. The programmatic nature of a smart contract means that it will automatically execute based on set parameters in order to reduce uncertainty in contractual agreements. This leads to less potential for disputes and allows businesses to streamline their processes while saving time and money on hiring staff who would otherwise handle tasks such as filing complaints.

Performance of “contractual terms” in an agreement or to enable the exchange or transaction of cryptoassets and other forms of property both on- and off-chain is guaranteed by the perpetual script of a smart contract that executes the agreement automatically once conditions are met. Yet, smart contracts are recognisable or valid legal instruments within the boundaries of contract and property law if they meet certain conditions such as enforceability. Contrary to perceptions of contractual streamlining and efficiency, understanding the uncertainty surrounding contracts involves the failure of the technology to meet many of the fundamental principles of contract law and theory concerning, for example, breach of contract and remedy for breach. Smart contracts, in that sense, appear to reduce contracting to a form and standard that is well below that developed by contract law and theory over many centuries in both civil and common law jurisdictions. (See: Robert Herian. Smart Contract Performance and the Rise of Restitution. Available from: https://www.researchgate.net/publication/333902595_Smart_Contract_Performance_and_the_Rise_of_Restitution [accessed Mar 18 2021]).
Chapter 3: Formation of smart contracts

Question 9

Please share your views below:

Distributed ledgers are typically associated with the financial industry, but their applications go beyond it. In a distributed ledger, transactions between parties form blocks and are verified by miners in exchange for monetary rewards. These agreements can be formed as smart contracts that execute automatically based on preset conditions - without the need for human intervention or involvement. When one party makes a change to the distributed ledger, the new version is broadcasted to all participants. As a result, it’s hard for parties to agree on something without reaching an agreement with each other first. One way in which parties can reach an agreement through interactions on a distributed ledger is by using signatures and cryptographic hash. Many jurisdictions have recognized that signatures on paper are not enough to meet legal requirements for forming an enforceable contract and it seems unlikely that such limitations would change when dealing with digital data.

Question 10

Please share your views below:

There are a number of programming languages which have been specifically designed to enable parties to reach agreement on a distributed ledger. One example is the algorithm used by Bitcoin, called Proof-of-Work (PoW). Another example is PBFT (Practical Byzantine Fault Tolerance), an approach that achieves consensus among nodes in a network without requiring them all to be online at the same time. The latter can be used for more than just cryptocurrency transactions and has been implemented in areas such as manufacturing. The information on the ledger can be public or private, with public ledgers typically used to verify ownership of cryptocurrency and more traditional uses being as an accounting book for banking institutions. One of the main obstacles to adopting blockchain technology is that many programmers are not versable in programming languages such as Solidity, Python, Java Script or C++.

Question 11

Please share your views below:

Offer and acceptance are the foundation of contract law. Contracts are agreements to exchange something of value (a promise, money, goods) in return for some service or good. It is often difficult to pinpoint when offer and acceptance occur - especially in a decentralized digital world where transactions take place without lawyers, courts or state regulation. The legal effect of a self-destruct function is to stop the contract from executing by rendering it unreadable by potential counterparties; in other words, it kills the possibility for offer and acceptance to occur. The rationale for not executing the contract, which may be due to a misrepresentation for instance, can be attributed by the destructing party ab initio, but in the present legal landscape (in the UK for example) there is no provision for arbitration by a judge, meaning it is an extra-legal process that could be based on problematic, vitiating factors. (See: Robert Herian (2021) Smart contracts: a remedial analysis, Information & Communications Technology Law, 30:1, 17-34)

Question 12

Please share your views below:

In a smart contract, parties agree to the terms of an agreement and enter into it by using DLT. Parties are often unknown to each other, but may have some information about them (e.g., their real name or phone number). Anonymity is one potential reason for not knowing the identity of a party when entering into a smart contract. This might be desirable if you want your transactions with someone else to remain private from third parties such as government agencies or financial institutions. Anonymity is a crucial factor in DLT and smart contracts. The use of anonymity in the context of digital transactions may have some advantages, but it also has disadvantages. Some people argue that having no identity information on a blockchain can be used to facilitate illegal activities such as money laundering or terrorist financing. There are different types of anonymity: ‘pseudonymous’ which means one’s name is not tied to their actions, ‘anonymous’ where one does not provide any personal information.

Question 13

Please share your views below:

The anonymity of the blockchain has made it a popular place for cryptocurrency transactions. However, this same anonymity makes smart contracts more difficult to enforce because identifying parties is impossible without outside evidence. In most cases, traditional contracts require no additional information beyond signatures and names on paper to be enforced in court. This means that if one party doesn’t live up to their obligations under the contract, they can often escape legal responsibility by claiming not to have signed or even know about the agreement. In order to determine the identity of parties to a smart contract, there are various pieces of evidence that might be available to a court. For example, if an individual has been identified by his or her real name in other documents (e.g., on social media), then the individual's name would constitute reliable identification evidence. Similarly, if an individual had signed up for the DLT system with their real-world details and sent money from their bank account into their wallet address at some point. A court will look to the objective facts of a situation in order to determine identity. In contrast, personal identification in cyberspace often involves subjective criteria like identifying information that is voluntarily provided by an individual or verified as belonging to an individual. In certain circumstances, a court may be able to ascertain the identity of parties based on circumstantial evidence such as IP addresses and other digital clues left behind during communications with each other.

Question 14

Please share your views below:

The law of consideration is a common law doctrine that imposes a requirement for bargains to be enforceable. A bargain without any quid pro quo or offer in return will not hold up in court. The notion behind the law is to prevent one party from unfairly benefiting at the expense of another. One way in which
consideration has been used in determining the enforceability of a contract is through its application as an inducement for entering into that agreement. This could be seen as difficult when applied to smart contracts because they are often made without any human intervention or interaction. There are various issues that arise when considering the law of consideration in regards to smart contracts. The foremost issue is whether or not a contract can be made without an explicit agreement between two parties. This would make it difficult for the court to enforce any promises made by one party. Another difficulty arises from assessing what happens if one party breaks their promise, and how this could be remedied with an automated system such as a smart contract. (See: Robert Herian (2021) Smart contracts: a remedial analysis, Information & Communications Technology Law, 30:1, 17-34)

**Question 15**

Please share your views below:

There are difficulties in determining whether parties have reached a certain and complete agreement. In fact, the legal principles of contract law that govern the issue are still being debated. There is also disagreement about what it means to “execute” a smart contract on blockchain technology. Is executing an agreement different from agreeing? If so, how? There are several reasons why there can be difficulty in determining whether the parties to a smart contract have reached a certain and complete agreement. One reason is that even if the terms of an agreement are set out clearly enough for all parties to understand them, it may not be clear how they should interpret those terms. The difficulties may stem from, for example, technological limitations or ambiguities in language. The lack of common understanding can be exacerbated by subtle nuances that are likely not well understood by all parties, such as how Ethereum gas might impact the final cost of an operation if one party fails to pay enough upfront for gas but rather pays as they go (rather than all at once). Parties must determine if they want their contract to include contingencies for all possible outcomes or account for only one desired outcome. For example, in Bitcoin mining pools, there are disagreements over which pool's transactions should go into blocks first because miners don't know who will win the block race when two pools both find solutions.

**Question 16**

Please share your views below:

Smart contracts typically define obligations, set the consequences of an obligation not being fulfilled, and specify how the agreement can be terminated. Despite this view on their legal status, there is some debate about whether smart contracts create legal relations between parties to a contract. One school of thought is that they do not generate any such relationship because they lack a physical or virtual form and were developed without any intention for them to be binding. Instances where the parties to a smart contract have expressly agreed that they do not intend to create legal relations may lead us to conclude that “smart contracts” are best understood as an example of private ordering and, therefore, in contrast with public law. But this may be too narrow a definition of what constitutes a “smart contract.” Smart contracts may be more broadly defined as automated self-executing contractual relationships encoded on the blockchain. Smart contracts provide us with some really interesting and important insights into the way in which we will be able to interact with each other within society.

**Question 17**

Please share your views below:

A smart contract is a self-executing, computerized transaction protocol that does not require human intervention. Smart contracts can be designed to execute the enforcement of other agreements and rules. Most smart contracts contain at least one clause expressly stating that they do not create legal relations. There are many reasons why this may be the case: parties may want to avoid any liability or it could be seen as immoral; it might also serve as a reminder for people using them in their transactions. The question of whether smart contracts are legal relations is one that has been the subject of much debate. Since there is a question of consideration given by one party to another, this likely impacts certainty of legal relations.

**Question 18**

Please share your views below:

The Interpretation Act 1978 (IA) defines “writing” as including letters, words and figures. It is not clear whether smart contract source code could meet the definition of “writing” in the IA. The IA does not define what kind of writing it covers but would seem to cover a variety of mediums such as printed text, hand-written text or even pictorial representations like drawings and paintings. If code falls within this definition this would provide for a wider range of legislative tools that can be used to regulate and enforce contracts executed through the use of blockchain technology. “Writing” as meaning any form of representation by which words, figures or symbols are recorded and the term includes: (a) a drawing, painting, diagram or map; (b) an engraving on stone or metal; (c) printing; and in particular writing includes hand-writing. There is no clear definition for what qualifies as smart contract source code but it may meet the definition of “writing” on these terms.

**Question 19**

Please share your views below:

The emergence of electronic signatures and smart contracts has led to an increase in the use of code as a way to store agreements. One might argue that the concept of signing or agreeing on something does not apply when discussing coded language because there is no physical act involved with coding. But while this may be true for digital signatures, it doesn't mean that you cannot “sign”. Many legal agreements are recorded solely in code. These include smart contracts on the Ethereum blockchain platform, and executable distributed code contracts (EDCCs) that exist on an open-source protocol called EOS. Parties may enter into these agreements by clicking a button or checking a box online without ever having to print out the agreement. In this way, parties can execute their obligations without relying on paper documentation. Under the European Union’s EIDAS regulation, an electronic signature is defined as “an electronic sound, symbol or process associated to or logically associated with a contract or other record and executed or adopted by a person with the intent to sign.” The EU recognizes that this definition applies irrespective of whether it is made on paper, in an electronic form, through voice synthesis and recognition techniques, but excludes devices which cannot independently create data. An example of parties signing an agreement recorded solely in code is where individual commits their credentials using RSA encryption and SHA-256 hashing, as well as encrypting the data itself with AES 256 bit encryption.

**Question 20**
DLT-based smart contracts are not yet compatible with eIDAS compliant advanced electronic signatures and qualified electronic signatures due to limitations inherent in the blockchain. The main issue is that signature validation requires each node on the network to validate every transaction – which would make them prohibitively expensive. The question of whether DLT smart contracts are compatible with eIDAS compliant advanced electronic signatures and qualified electronic signatures is an important one. A possible solution to this issue could be for the individual involved in a contract to sign off on it digitally, rather than being able to utilise the signature created by their private key. This would mean that both parties can verify each other's identity as well as confirm that they have seen the contract terms before signing it themselves. Further, in order for a DLT smart contract to utilise eIDAS compliant advanced electronic signatures and qualified electronic signatures, it would need a digital signature scheme that is resistant to quantum computing attacks and would also have an approach in place that guarantees authenticity without relying on trusted third parties.

Question 21

Please share your views below:

Blockchain technology is currently being used in the real estate industry to record deeds, e.g. Propy. It provides a safe and immutable way of recording deeds on the blockchain ledger which can be publicly verified by anyone with an internet connection. Blockchain technology has been used for over three years to record documents such as wills, trusts, powers of attorney, birth certificates and more. Blockchain is now a deed-recording technology. An example of a blockchain-based deed is in Saudi Arabia, where an apartment sale was conducted using the Ethereum blockchain. In the transaction, a buyer from Canada and the seller agreed to record their contract terms on the blockchain through smart contracts coded into self-executing pieces of computer code. Blockchain technology offers some significant advantages over traditional systems for recording deeds: greater transparency (since all transactions are available for public inspection), reduced fraud risk.

Question 22

Please share your views below:

Chapter 4: Interpretation of smart contracts

Question 23

Please share your views below:

There are many variables that can complicate the process of interpretation, such as whether terms are found in natural language or coded text. It is also important to consider if an agreement contains other agreements or does not clearly define what is being agreed upon. This could be difficult for judges because they may not have any experience with interpreting these types of contracts. The US Securities and Exchange Commission has issued guidance on how to interpret smart contracts, in order to help identify whether terms of a particular smart contract are contained in the natural language component or the coded component of the smart contract, or both. The SEC suggests that, in many cases, it will be difficult for courts and other interpreters to determine with certainty which parts of a written agreement were included within the parties' intent when they entered into their transaction because those provisions may not be expressly identified. The SEC is now procuring a blockchain forensics tool that can analyze smart contracts and, preferably, highlight their security issues.

Question 24

Please share your views below:

The legal issue of interpreting a smart contract is one that has not been fully explored by the courts, but it is one that will need to be addressed in the near future. In many cases, it can be difficult to determine whether a term is found in the natural language component or coded component of a smart contract. Some contracts are clearly written in both components, and determining which part should take precedence would depend on who drafted the agreement. There is not necessarily a clear distinction between the natural language component and the coded component of a smart contract. This makes it difficult to interpret terms in a smart contract, because they can be found in both components. The principles of interpretation are unclear when applied to this situation. It is important to identify where certain words and phrases come from because they may have different interpretations depending on their context. For example, if “the price shall be determined by” appears in both components then it would be interpreted as that whichever section determines the final sale price (coded or natural) should use this phrase.

Question 25

Please share your views below:

This depends on the type of contract. A reasonable person ought to apply in terms of, for example, hybrid smart contracts where natural or non-machine language is used and/or the contract has direct egal effects on named parties. Courts should not look to the intent of the parties in determining what terms of smart contracts are reasonable or unreasonable where code is meant to be read by computers and thus it should be up to the computer to determine what constitutes a reasonable term for such an agreement. In this case meaning can be determined by a functioning computer.

Question 26

Please share your views below:

In general, the performance of a smart contract cannot always be predicted based on a reading of the code. This is because there are many variables that affect how contracts will perform. Some possible examples of this could include unforeseen events happening after coding has been completed, an oversight in one part of the code leading to errors in another section, or even unintended changes made by third parties such as hackers. Smart contracts can also create new terms...
and conditions in relation to the agreement at any time based on external data inputs. This means that performance of coded terms cannot always be predicted when reading through the contract because it is subject to change depending on future circumstances. A good example would be if someone wrote a smart contract with terms about monthly payments for renting an apartment or house and failed to account for changes in rent rates. Finally, performance of smart contracts can't always be predicted as the code is not always read, or even able to be read by anyone other than the original programmers ad varies based on how it's implemented and what data was used when coding it.

Question 27

Please share your views below:

If a party is unable to read the terms of a smart contract because they lack fluency in computer code, it may be impossible for them to contest an unfair or hidden term. Practical and procedural steps could include: requiring all contracts be translated into one of several languages; developing coding standards that are easy-to-read by laypeople; or offering free online tutorials for interpreting these types of agreements. There are many ways that contracts can be disputed. The dispute may arise from a disagreement about the interpretation of the contract terms, as is likely to happen with smart contracts coded in software code. If a court must resolve such a dispute, three possible approaches are: (1) asking an arbitrator for guidance; (2) turning to legislation and judicial precedent; and (3) relying on private sector precedents.

Question 28

Please share your views below:

Smart contracts may not utilise natural language to make their intentions clear in respect of any coded terms or the contract as a whole. The use of natural language can make it easier for people who are unfamiliar with blockchain technology and/or programming languages to understand the intent behind the contractual agreement. For example, if a party has agreed that they will not transfer any of the tokens without written consent from the other party, this could be explicitly stated within the contract so there is no confusion over what was meant by 'without written consent'. This is an example of how natural language can be used in smart contracts to clarify intent and avoid ambiguity.

Question 29

Please share your views below:

Contract law traditionally focuses on the actual terms of a contract, but evidence of pre-contractual negotiations is often used to interpret those terms. Evidence of pre-contractual negotiations can be found in many forms: conversations, correspondence, and even oral statements made by one party to another before any agreement was reached. Courts have typically allowed this type of evidence as an aid to interpretation where it is reasonable for them to do so, and the same may be said for smart contracts where this includes an audit of the source code, for instance.

Question 30

Please share your views below:

Chapter 5: Remedies and smart contracts

Question 31

Please share your views below:

As a remedy predicated on the mistake of the record, rectification may begin with fundamental errors in contract drafting easily reproduced in the smart contract context due to errors in coding. Unlike traditional contracts, however, mistakes in smart contracts can be exacerbated by the architecture in which smart contracts operate, namely, the blockchain. A blockchain provides a highly reliable witness to events, documents, or instruments such as contracts due to the distributed way the record simultaneously updates across nodes, and because they rely on hash functions, timestamping, and cryptography for security and pseudonymity. While it is debatable that a blockchain is completely immutable or, indeed, that timestamping provides an entirely precise record of events, as a database a blockchain is nevertheless highly tamper-proof relative to other forms of electronic data storage, and to hack, change, or rectify a record is virtually impossible at present. These sorts of features have been mooted as the basis of a new and radical form of transparency for the contemporary digital age. Equally, however, it causes concern regarding privacy law, including the right to erasure of personal data (the "right to be forgotten") enshrined in the European Union’s General Data Protection Regulation (GDPR). Quite simply a threat lies in the perpetuity of the data record and the fact that this could undermine the legal legitimacy of the record, rather than strengthen it.

In the case of a contract subject to an order for rectification a similar concern arises. Returning to the outline of rectification given above we can see a notable temporal characteristic at its heart: 'Rectification is retrospective, and affects steps taken by the parties in the meantime. But the instrument remains binding in its uncorrected form until rectification is actually ordered' [emphasis added]. Applying the remedy to smart contracts on these terms poses the obvious problem that rectification will be incapable of erasing any former version or versions of a disputed instrument. Moreover, whereas 'there is no need to execute a new document' in a conventional order for rectification, there can be no choice but to code and execute a new version to countermand (over-write) a mistaken smart contract. Issues of time and temporality are hardly new concerns for the courts, especially when it comes to ascertaining the order in which disputed events occurred, money was transacted, or legal instruments executed. But the multiplicity and potential proliferation of evidentiary documentation and the semi- or full autonomy of smart contracting could prove difficult for courts to monitor. Indeed, it would almost certainly require additional remedial or monitoring technologies rather than human intervention alone to ensure rectification occurs and forms the basis of the final contract as performed. Once again, difficult questions regarding the legal recognition of smart contracts apropos human interest and adjudication flow from this context, as does the future of remedial applications that are capable of meaningful execution of arbitration functions. (See: Robert Herian (2021) Smart contracts: a remedial analysis, Information & Communications Technology Law, 30:1, 17-34)

Question 32
Mistakes as to the agreement are not the focus of rectification, only the mistakes in the record of the agreement. Key to the nature and operations of smart contracts is not simply that they record an agreement, but that they have the capacity to perform that agreement in whatever form is intended. The remedy in relation to smart contracts must initially tackle mistakes in the code or programming as it would tackle mistakes in the drafting of a conventional contract. This does not seem untoward or unreasonable where the smart contract reflects a straightforward, single transaction between parties, such as the purchase of a chattel. In such cases any mistake in the code of the smart contract which leads to an outcome not consented to or intended by the parties – the purchase of a red car but delivery of a black car for example – could be rectified with little or no dispute concerning the validity of the remedy. The same cannot necessarily be said where a mistake (or bug) in the code of a genesis instrument produces a variety of unintended outcomes in the subsequent agreements performed semi- or fully autonomously, such as those fulfilled machine-to-machine for instance as part of a DAO. Nor where a mode of machine learning reinterprets the nature of the agreement once execution has already begun, and, therefore, any mistake as it is commonly understood in the doctrine of conventional rectification cannot necessarily be traced to a genesis instrument at all. Common sense dictates that the contract related to the genesis instrument remains the target for remedy in both cases, but in the latter context the notion of consent, as well as intention, is obfuscated, especially once AI becomes an explicit and defining factor in contractual processes. Would it be correct to say that the “intention” manifested by AI or less advanced algorithmic machine learning reflects the intentions of the parties to the contractual process? If the answer is yes, then it would presuppose that the intention of human actors (the promissir and promisor for example) must reside in a reasonable knowledge or expectation of the outcome produced by, what is in effect, alien intelligence. If machine learning does not advance beyond merely improving instrumental bureaucratic efficiencies, however, then it might be reasonable to suggest that human insight into the nature of the intention underpinning that bureaucratic process did, indeed, continue to reflect human consent and intention. (See: Robert Herian (2021) Smart contracts: a remedial analysis, Information & Communications Technology Law, 30:1, 17-34)

Question 33

Please share your views below:

Precautions taken before smart contract execution are a topic of much debate. One cannot predict all possible outcomes in the code, which means it is impossible to test for every possible scenario. This uncertainty may be too risky to bear and parties will not enter into any smart contracts until someone has created a foolproof system of testing the code. But, some bugs can only be discovered during runtime, rather than testing beforehand. Precautions taken before entering into a smart contract vary depending on how they are being used and what type of information will be handled by the smart contract. Some common steps include reviewing source code for bugs, checking developer history (e.g., credentials), performing audits, etc. The simplest step is for both parties to verify what has been agreed upon. This should be done by comparing computer code or language versions of any potential agreement between the two parties, which may not be identical due to translation issues, etc.

Question 34

Please share your views below:

A unilateral mistake is a mistake made by one party to the contract without the knowledge of the other. In common law, if a term in a contract is mistaken then that part of the contract can be considered void. This principle has been extended to mistakes about terms in written contracts and oral contracts when these are seen as an essential element of the contract (i.e., there was no actual meeting of minds). However, many smart contracts are concluded automatically without human intervention. Unilateral mistakes are typically treated as a type of mistake where one party makes an error in understanding the other's contract offer. However, when it comes to autonomous smart contracts without human intervention there is more than just one party making a unilateral mistake. The computer program that operates the smart contract could make an error or misunderstanding in its interpretation of the contractual terms which leads to its inability to fulfill its obligations under the agreement. This leaves open questions about how these types of unilateral mistakes should be handled.

Question 35

Please share your views below:

The application of the law to determine whether a smart contract has been entered into as a result of misrepresentation is not always clear. How does one discern if a misrepresentation occurred? This issue arises in any type of contractual agreement, but can be especially difficult when dealing with technology that doesn’t leave room for interpretation. The problem is exacerbated if smart contracts are legally binding and thus enforceable without need for third-party enforcement or reliance on legal procedures. There are various reasons for a person to enter into a contract, including fraud or misrepresentation. A smart contract is just like any other type of contract and can be voidable (made to "self-destruct") due to fraud or misrepresentation as well. In cases of misrepresentation, the role of rescission can be summarized as follows:

Before the passing of the Misrepresentation Act 1967, the position with regard to rescission was, broadly speaking, as follows: where a person was induced to enter into a contract as a result of a misrepresentation by the other party to the contract, and the misrepresentation never became incorporated as a contractual term, the representee was entitled to rescind the contract, whether the misrepresentation was fraudulent, negligent or wholly innocent. At common law, the right to rescind was confined to cases in which the misrepresentation was fraudulent or in which there was a total failure of consideration, but in equity there was a right to rescind even for innocent misrepresentation. (See: Robert Herian (2021) Smart contracts: a remedial analysis, Information & Communications Technology Law, 30:1, 17-34)

Question 36

Please share your views below:

Since the Act of 1967 this right of rescission is qualified (except in cases of fraud) by the court’s power to refuse rescission and award damages in lieu, and there remain certain bars to rescission in all cases. But it still remains a general proposition that the remedy for misrepresentation is rescission of the contract. A court will deny restitution if compensation (damages) is regarded as a better or more suitable outcome. This means that the reasons for justifying rescission must be tightly drawn if they are to succeed and not be “barred”. Such reasoning must anticipate factors including whether there has been an affirmation of the disputed contract by the party seeking the remedy, or whether there has been excessive delay in seeking the remedy. Both factors are particularly germane.
considering those aspects of smart contracts that relate to and promise efficiency gains by virtue of the speed with which smart transactions occur, and similar benefits from the autonomous or semi-autonomous nature of the smart contracting processes that enable transactions to be finalized with little or no human intervention. The latter of these issues is of concern because it is difficult to make a case for rescission if performance of the contract cannot be stopped due to the persistence of the automated processes ensuring absolute performance of the smart contract as written. Even if that contract misrepresents the intention or consent of the parties. Moreover, a smart contract that completely executes may reasonably be said to have finalized the transactional processes it was designed for, but this is not necessarily the same as discharging the contract, which in law or equity is a different measure. (See: Robert Herian (2021) Smart contracts: a remedial analysis, Information & Communications Technology Law, 30:1, 17-34)

Question 37

Please share your views below :

In an age where the average contract is written in computer code, it may be difficult to award damages for breach of contract. The problem with awarding damages in the event of a breach of contract is that when a natural language contract is performed automatically by computer code, it becomes unclear how to calculate damages if one party breaches their obligations under the agreement. The use of smart contracts has changed this landscape and makes determining compensation more difficult than ever before. A trend in smart contracts to move away from the natural language that lawyers are used to, and instead use computer code for the terms of a contract is an interesting development because it can lead to damages being awarded automatically by a computer rather than a human judge.

Question 38

Please share your views below :

Termination has traditionally been dealt with through legal principles of breach, frustration and mutual agreement, but these concepts are not easily applied to smart contracts that execute automatically. There are a number of approaches in this area which have already been proposed or developed by various stakeholders, including making smart contract termination explicit through declarative language. This would allow parties to terminate a contract at any time if they can agree. When there are automated terms in place for termination, which may be determined or set out in the contract, it becomes more difficult to ascertain what will happen on that day and how it will affect both parties. The blockchain ledger technology offers potential solutions for these issues because the ledger can act as a timestamping service and provide proof of existence. The information about who has ownership rights can be made out at the end date or another moment in time. the so-called "self-destruct" mechanism of smart contracts may also play a role here. (See: Robert Herian (2018) Regulating Blockchain: Critical Perspectives in Law and Technology, Routledge; and Robert Herian (2021) Smart contracts: a remedial analysis, Information & Communications Technology Law, 30:1, 17-34)

Question 39

Please share your views below :

Breath of contract is a vital sign of healthy contract law, not an inconvenience to be programmed-out of agreements. This is because breach shows that a definition of contracts in terms of sets of promises does not give full force to the interrelationship of the obligations of the parties which exists in many contracts’, an interrelationship which we see particularly in the remedy’s availability for substantial failure in performance, by which an injured party may end his own obligations because of the failure of the other party to perform his side of the bargain. Accompanying many remedies relating to the breach of contract are damages and costs for litigation. In contrast, the equitable remedy of specific performance enables enforcement of an agreement for which money (damages or compensation) does not suffice. To undermine or dismiss remedies rooted in performance seems academic in a world of smart contracts because the one thing smart contracts almost always guarantee is performance. Yet the mere fact of their insistence on performance does not mean smart contracts “solve” the “problem” of a suitable remedy for situations in which monetary compensation is not suitable or desirable.

Question 40

Please share your views below :

Mistakes, as they say, happen. But in contract law, mistakes assume significance regarding contract frustration. Courts aim to uphold contracts when and where possible, but this is not always desirable on the facts. Such processes show that contract is flexible, contingent, and, perhaps above all else, a reflection of the inherent messiness of human enterprise that leads all too often to mistakes and frustration of agreements. This, for some technologists, may be reason enough to find a “solution” to the “problem” of traditional contract law. But it is incumbent on smart contract designers to remember that contracts exist not only in an immature state, like vending machines. Nor is it desirable for contracts to do so if a balance between the express and consensual execution of rules-based agreements and the moral obligation of promise and performance is to remain intact, both central tenets of legally binding agreements. Put another way, contract is a legal norm that has successfully underwritten and influenced many social structures far beyond the abundance of today’s commercial transactions. (See: Robert Herian (2021) Smart contracts: a remedial analysis, Information & Communications Technology Law, 30:1, 17-34)

Question 41

Please share your views below::

Question 42

Please share your views below :

Vending machines (as one of the original models for smart contracts) perform simple, automated and often seamless transactions. Yet such transactions leave open questions of enforcement if the machine fails to convey the product selected by a purchaser. The vending machine/smart contract model accounts for unproblematic agreements and transactions properly performed, but not necessarily instances of mistake, illegality, indefiniteness, change of circumstances, or other traditional grounds for remedy and restitution.
A fundamental problem with the vending machine qua smart contract model is it ignores a truism at the heart of traditional contract law by seeking to redefine who or what are the basic stakeholders of the contracting process. Traditionally property does not contract, people do, but the categorical performance of smart contracts embedded in machine-to-machine property and asset transactions, which can be established but not necessarily overseen by parties to an agreement, turns the truism on its head and renders uncertain the nature of any liabilities that may accrue during the life of the contract. Another way to see this is that the electronic agreement makes rights vanish, and this must be guarded against. (See: Robert Herian (2021) Smart contracts: a remedial analysis, Information & Communications Technology Law, 30:1, 17-34)

Chapter 6: Consumers and smart contracts

Question 43

Please share your views below:

Decentralized finance; Peer-to-peer Transactions and Payments; Digital Identity; Digital Marketplaces; The Energy and Data Marketplace; Borrowing and Lending; Tokenization; Non-fungible tokens (NFTs)

Question 44

Please share your views below:

12-18 months

Question 45

Please share your views below:

The adoption of the blockchain and smart contracts has resulted in a new wave of consumer protection issues. Potential challenges in applying consumer protection laws to such contracts, as well as other protections that may be necessary or important, include how courts determine what constitutes unfair terms for consumers? Courts have generally considered certain factors when evaluating whether an agreement is unconscionable, including: (i) if there was unequal bargaining power; (ii) if the term imposes an overly harsh penalty. Unconscionability could, in the emerging context of smart contract protections and enforcement, be explored by AI interventions introduced to or overlaid within the machine-to-machine environment, rather than attempting to code for unconscionability.

Question 46

Please share your views below:

With an increasing number of people turning to online marketplaces for goods and services, there is a clear demand for cheaper transactions and simpler procedures. In this context, the use of smart contracts could be attractive: they allow consumers to automate their purchases with minimum hassle by removing intermediaries such as banks or credit card companies from the process. However, if not designed properly these contracts can lead to significant problems. There is a case for an explicit legal requirement that terms of a consumer contract which are fully or partly in code must be explained in natural language before the conclusion of the contract. The question arises as to whether there should be additional protections when entering into smart contracts, and if so what they might entail.

Chapter 7: Jurisdiction and smart contracts

Question 47

Please share your views below:

There are many challenges that may arise when determining the place of formation for a smart contract, such as whether it has been created through an internet-based connection or remotely and also what jurisdiction laws govern the data within a particular location. The complexity of this issue stems from the digital nature of these contracts, which makes their origination difficult to identify; one way would be by identifying who holds control over the blockchain address associated with the contract. The contract law principles that are relevant to determining the jurisdiction of a dispute in relation to a smart contract, and the legal implications arising from this decision, have not yet been fully established. It is possible that an agent's actions and location could be taken into account when deciding which country has jurisdiction over a dispute, as discussed in relation to cryptoassets in AA v Persons unknown [2019] & Ruscoe v Cryptopia [2020]. This would depend on whether the agent was operating within their territory or whether they were outside of it at the time. A jurisdiction clause (or perhaps GPS-style pin or marker) could be embedded in smart contracts to resolve issues of jurisdiction in the event of litigation.

Question 48

Please share your views below:

See above.

Question 49

Please share your views below:
Under Article 3(1) of the Rome I Regulation, parties may choose to have their relationship governed by either (i) the law applicable to that relationship or (ii) the rules contained in a particular agreement, such as a contract for services or an online platform’s protocol. If a private law contract contains both provisions for traditional contractual performance and those which require performance by means of computer code, then at least some courts may be inclined to treat them as hybrid contracts governed by dual regimes. One consequence would be that the court might look first at applicable national law before applying any terms.

Question 50
Please share your views below:

Question 51
Please share your views below:

Question 52
Please share your views below:

Question 53
Please share your views below:

A jurisdiction clause (or perhaps GPS-style pin or marker) could be embedded in smart contracts to resolve issues of jurisdiction in the event of litigation, and this could equally apply to an order for performance or disagreements.

Question 54
Please share your views below:

Regulations requiring party location clauses in smart contract design.

Question 55
Please share your views below:

Chapter 8: Final questions

Question 56
Please share your views below:

A lack of contingent intelligence has led to a reliance on “data feeds” or “oracles”, third party aggregators that supply smart contracts with necessary data and information (e.g. data from a metrological station), to connect them to the “real world” and enabling effective operation to a reasonable level of legal competence or regulatory compliance. There is a prominent “oracle problem” that foreshadows the development of smart contracts, not least because the accuracy and timeliness of this information is not guaranteed and it is the task of a secondary contract author - the contract that utilises the data feed - to determine how much trust can be placed in any single data feed.

Question 57
Please share your views below:

Question 58
Please share your views below:

The problem of bridging real and virtual worlds (the oracle problem) and bringing laws of contract and property into digital harmony, remain major obstacles for smart contract design and implementation. Whether we ought to see smart contracts as contracts at all remains open to debate. We might understand smart contracts instead as a piece within the larger jigsaw puzzle that is contract law, rather than an alternative to or replacement for traditional contracts. It is clear from a legal standpoint that smart contracts do not provide a wholly viable alternative to existing forms of contract, nor pose a threat.
Chapter 2: What is a smart contract?

Question 1

Please share your views below:

A few examples include arbitration agreements (subject to the jurisdiction in question; English law seems to be relaxed on the automation aspects of the arbitration agreement), and contracts involved in trade supply chains such as carriage of goods contracts.

Specific examples of such projects are CodeLegit for the automation of arbitration agreements, the Tradelens platform for the automation of contracts on the supply chain and agreement for the automation of contracts more generally.

Question 2

Please share your views below:

Yes. Even though other new technologies such as Artificial Intelligence involve automation, smart contracts that use DLT technology have DLT-based specificities such as party anonymity, how data is processed and how it is stored.

Question 3

Please share your views below:

1) Private permissioned network: where only participants with a known identity can join the network and have access to the data. They are used for transactions that require a smaller and more private network. These can be used for supply chain transactions for example, or an arbitration agreement.

2) Public permissionless networks: open to the public whereby all participants can make requests for transactions and be able to read the data. They are used for larger public networks that are open to users from the public. These are used for cryptocurrencies for example.

Question 4
Natural language contract with automated performance

Please provide examples of how these forms of smart contract have been used in practice:

Smart contract arbitration platforms such as CodeLegit have adopted the possibility of having a natural language contract with automated performance, a hybrid contract or a solely code contract.

Others such as Kleros have adopted a code contract.

Question 5

Please share your views below:

The parties have the option of agreeing to the terms off the chain in natural language contracts, and for those to be implemented via the blockchain platform.

Question 6

Please share your views below:

See the CodeLegit Arbitration Library for example available at: https://docs.google.com/document/d/1v_AdWbMuc2Ei70ghITC1mYX4_5VQsF_28O4PsLckNM4/edit

Question 7

Please share your views below:

Yes, for arbitration agreements such as the CodeLegit platform.

1) Technology used: blockchain
2) Verification of information
3) Automation depends on the design adopted by the parties
4) Mostly for B2B contracts

Question 8

Please share your views below:

Benefits:
2) Security and Confidentiality.

Limitations:
1) Limited flexibility - which could have the consequence of leading to additional costs.
2) Data Privacy Issues.
3) Inefficiency: for public permissionless networks.

Chapter 3: Formation of smart contracts

Question 9

Please share your views below:

Question 10

Please share your views below:

Question 11

Please share your views below:

Question 12

Please share your views below:

Question 13

Please share your views below:

Using their private key; especially for private permissioned networks.

Question 14
Question 15
Please share your views below:
Yes, difficulty in interpreting what their reasonable expectations were and knowing what terms were implied, especially in a B2B contract.

Question 16
Please share your views below:
No.

Question 17
Please share your views below:
Yes, especially for consumers.

Question 18
Please share your views below:
Yes. The in writing requirement in the English Arbitration Act 1996 is also open to considering an arbitration agreement in code as written.

Question 19
Please share your views below:
Yes.
Cleartext signing-digital but readable document-used by the Mattereum platform for blockchain-based arbitration.

Question 20
Please share your views below:
Yes, for private permissioned contracts.
This is more difficult for public permissionless networks.

Question 21
Please share your views below:
No.

Question 22
Please share your views below:
Chapter 4: Interpretation of smart contracts

Question 23
Please share your views below:
Yes; the judge would need to be technologically savvy and problems identifying implied terms or terms accepted via conduct.

Question 24
Please share your views below:
When the contract starts being performed/enforced. Time of payment, or payment penalties for late payment are examples.

Question 25
Please share your views below:
Reasonable person with knowledge of the relevant code.

Question 26

Please share your views below:

If there are errors in the code or bugs.

Question 27

Please share your views below:

Training judges on how smart contracts and coding work.

Question 28

Please share your views below:

It is possible, platforms such as Codelegit (for smart contract arbitration) offer this possibility.

Question 29

Please share your views below:

Customs, previous dealings between the parties and what is considered to be reasonable from a business perspective.

Question 30

Please share your views below:

If the business common sense approach is kept for the interpretation of B2B contracts, it would be more helpful than using the literal approach.

Chapter 5: Remedies and smart contracts

Question 31

Please share your views below:

Yes, due to the lack of flexibility from a technical ICT perspective, which would make it prone to the enforcement of actions that the parties did not intend in the transactions carried out on the platform. Also, the automated enforcement feature can raise legal and ethical concerns in cases where for example the contract lacks legal validity or is tainted by an irregularity, and programmed payment is imposed through it.

Question 32

Please share your views below:

Yes, it would be difficult to establish the liability of the programmer here and how he would translate the parties’ intentions that could lead to a mistake.

Question 33

Please share your views below:

To be prompted by the system to check that all the terms of the contract are in order by both parties.

Question 34

Please share your views below:

Question 35

Please share your views below:

Question 36

Please share your views below:

Question 37

Please share your views below:

Yes, especially if the terms of the natural language contract were vague, not clear or ambiguous.
Question 38
Please share your views below:
Yes, due to the issues mentioned above.

Question 39
Please share your views below:

Question 40
Please share your views below:

Question 41
Please share your views below:

Question 42
Please share your views below:

Chapter 7: Jurisdiction and smart contracts

Question 47
Please share your views below:
Yes, especially for public permissioned networks.

Question 48
Please share your views below:

Question 49
Please share your views below:

Question 50
Please share your views below:
Yes, like in an arbitration agreement. The CodeLegit arbitration library has reference to this for example.

Question 51
Please share your views below:

Question 52
Please share your views below:

Question 53
Please share your views below:

Question 54
Please share your views below:

Question 55
Please share your views below:

Chapter 8: Final questions

Question 56
Please share your views below:

Question 57
Please share your views below:

The EU, the US and China are developing rules on this.

Question 58

Please share your views below::
### Law Commission – Smart Contracts Call for Evidence Questions
#### Response of Eversheds Sutherland LLP

<table>
<thead>
<tr>
<th>Question reference from call for evidence</th>
<th>Answer</th>
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<tbody>
<tr>
<td>Q1</td>
<td>What kinds of contractual obligations can currently be automated using computer programs? Please provide specific examples where possible.</td>
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<tr>
<td></td>
<td>We have recently advised on a significant project for a consortium of agricultural commodity providers on the creation of a platform utilising DLT (blockchain) technology to standardize and digitize the global trade in agricultural commodities (soybeans, corn, wheat, barley, sugar and other grains and oil-seeds) for the benefit of the industry as a whole.</td>
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<td>Using blockchain and digital signatures and (in the future) smart contracts, the platform’s success will revolutionize the way this industry operates trade in bulk commodities and the efficiencies it creates, including:</td>
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<td>* moving from paper-based to digital processes;</td>
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<td>* creating end-to-end visibility and transparency;</td>
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<td>* speeding up the end-to-end process; and</td>
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<td>* reducing the risk of human error.</td>
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<td></td>
<td>The technology will introduce functionality (in a future release) for smart contracts to be formed, via this platform, as certain events occur in the supply chain process. For example, if a shipment of soybeans reaches a port, the applicable customs check completed, bills of lading and other relevant forms completed and evidenced on the platform – this could automatically trigger the release of the payment for the trade and completion of the contract between buyer and seller for the trade.</td>
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<td>However, whilst the platform has been created using DLT technology and the foundations are in place for a platform which could create smart contracts, it will not (at this stage) be used to do the same (for example, as a trading platform). Instead, the platform will be predominantly used as a communication tool to which parties can upload contracts but with a requirement for separate, human interaction in order to execute and finalise contracts.</td>
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<td>If the platform was to be used as (for example) a trading platform in the future, with the ability for transactions to be automatically concluded through the platform, this would add a further layer of complexity and additional legal and commercial considerations for our client (who is a central administrator to the platform (see comments on the same below)), including in respect of (i) its obligations to platform participants using the platform, (ii) the role of the</td>
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<td>Do you agree that the Law Commission’s scoping study on smart contracts should be limited to contracts which use distributed ledger technology? If not, please provide details of other technologies which are used to support smart contracts, and their prevalence.</td>
<td>It seems artificial to limit the scoping study to DLT / Blockchain based solutions. Although DLT is likely to be the primary technology underpinning Smart Contract solutions, given the features of DLT which lend themselves to the creation of smart contracts (for example, immutability, transparency, non-repudiation, security, and the “investibility” of Blockchain solutions), there is no reason why parties cannot create, manage and perform smart contracts using other technology tools and models. These currently exist in the form of trading platforms, exchanges, and auctions where forms of smart contracts are created and executed by participating parties (e.g., an offer to acquire a particular asset, service or commodity at a certain trigger price, on satisfying certain pre-defined conditions, at a specific time-point or other external micro or macro-economic or geopolitical factors – e.g., a specified movement in exchange rates or interest rates, or the election of a political candidate). Please also see our comments below in respect of assumptions around permissioned / permissionless blockchain platforms and competition issues which could be triggered by giving other counterparties visibility of transactions on the Blockchain.</td>
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<td>When, and why, do parties to smart contracts decide to use: (1) permissioned DLT systems? (2) permission less DLT systems?</td>
<td>There is a pre-conceived notion that in Blockchain platforms the participants are anonymous but the transactions are public (and replicated / recorded across all or a majority of the nodes on the Blockchain). However in some of the platforms where we have been advising, there is a presumption that the participants may be known to each other (and possibly to other participants on the Blockchain, and to the administrator) but that the detail of the transactions themselves are suppressed. This is because the underlying transactions are confidential, the prices and volumes are proprietary and market sensitive and the counterparties (and other participants) are or may be competitors.</td>
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<td>In supply-chain Blockchain solutions, our experience is that systems are most commonly permissioned and access is limited to designated participants (and may be subject to AMI/KYC checks) and the roles of the participants is limited to what they can do and see on the blockchain. This is absolutely critical for most of our clients, many of whom operate in highly regulated industries and the security of the blockchain and the individual nodes in which transactions take place is its most critical feature. In the example of supply-chain solutions, competitors and subject to strict anti-competition laws and regulations. There are also multiple other parties involved in the process (such as agents, brokers, surveyors, insurers, vessel owners, customs officials, banks, law firms, etc.). The security of the data being processed and the identity of the entities and the transactions taking place is therefore absolutely fundamental. Whilst in the example referred to above, there is a centralised administrator who approves new participants to the platform, the ledger is still decentralised as each node will have an identical copy of the entire ledger. However, platform participants can only access information related to their data and the interactions or transactions with other platform participants. The platform uses encryption algorithms and ensures the confidentiality of transactional data as well as the non-repudiation of messages, nominations and digital signatures. Each platform participant uses a pair of cryptographic keys that unequivocally identifies them and every action that is performed on the platform. These are security features that are available on and can be utilised within a DLT system.</td>
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<td>Q4 Which of the three forms of smart contract discussed in para 2.32 of the call for evidence are most commonly used in existing smart contracts or smart contracts which are in development? Please provide examples of how these forms of smart contract have been used in practice.</td>
<td>In our experience, the most common use is of a natural language contract in which some of the contractual obligations are performed automatically. Contract formation and contract terms are deliberately outside the smart contract elements. There are hybrid elements as not all contractual obligations are automated. As set out above, we have seen the potential for smart contracts used on a platform for international trade supply chains. Any smart contracts entered into on this platform would most likely fall into the first form of smart contract i.e. a natural language contract where some of the contractual obligations are performed (or recorded) automatically but the code itself is a tool employed</td>
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<td>by the parties to perform the obligations (rather than the code itself recording any contractual obligations).</td>
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The key feature for us, is that the smart contract elements of the process record “conditions” of the contract which may trigger contractual obligations set out in the natural language agreement – for example the receipt of goods by the buyer or its agent at a designated location (and satisfying other requirements of the contract and accompanying evidences) may trigger an automatic notification to the buyer’s bank for release of funds to the seller.

Our experience to date, and also the view of our clients, is that the third form of smart contract (i.e. smart contracts recorded solely in the code of a computer program) creates a number of additional legal considerations and questions but is not something we will routinely see in the short to medium term in the everyday business transactions of our clients in a supply-chain context.

Q5 How do code and natural language interact in hybrid smart contracts currently in existence or in development and which terms are generally coded?

The most common interaction that we see between natural language and hybrid smart contracts is the scenario where a natural language contract sits outside the DLT system and relevant provisions of the same are translated into code and published to the DLT system (as a means of implementation, but without contractual effect).

Q6 What process do the parties follow (or plan to follow) in negotiating, drafting and entering into a smart contract? Please explain in particular:

1. Where all the contractual obligations are contained in a natural language agreement and the code is intended merely to perform those obligations, the practical steps involved in coding the parties’ rights and obligations contained in the natural language agreement;
2. Where the parties intend that there will be a hybrid contract or a code only contract, the practical steps involved in drafting, negotiating and agreeing the code of the smart contract;
3. Where there is a hybrid contract, whether the natural language element and the coded element are entered into

In the example we refer to above, the contract (and auto-executing or “smart” contract components) are negotiated by the counter parties in advance or follow a standard format for the industry. The platform participants use the Blockchain platform to record the post-trade execution of the arrangement, and are subject to the platform user terms which allow them to use the blockchain platform.

Only verified participants are allowed to join and transact, with a defined onboarding process before a participant can gain access to the platform’s functions (and an offboarding process when they leave). An approval process is required which includes the signing up to of participant terms to create a contractual nexus with the platform service provider who administers the Blockchain platform on behalf of participants. The administrator has visibility over all the transactions on the Blockchain but does not have access to the underlying detail of contracts executed on the platform (which remain confidential as between the parties).

To this extent, each individual transaction (or "string") forms a separate side-chain off the main Blockchain.
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<td>contemporaneously or at different times; and (4) the role played by third party service providers (such as computer coders and software firms) in this process.</td>
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Q7 Are you aware of any examples of use cases for smart contracts beyond those we give in the call for evidence, or variations on the use cases we give, which are being developed, are at proof of concept stage or are already operational? If so, please explain: (1) the technology used to create the smart contract; (2) the role played (if any) by oracles in the performance of the smart contract; (3) the contractual terms (if any) performed automatically by computer programs; and (4) whether the smart contract is a business to business commercial contract, a peer to peer contract or a business to consumer contract. |

Q8 What benefits and cost savings can smart contracts provide compared with traditional contracts? Will increased use of smart contracts lead to any additional costs? Please provide details and any available qualitative and quantitative evidence. (Again based on our case study for consistency) The benefits are: 
- automation of the paper-based processes involved in a complex supply chain is an obvious efficiency (and well recognised by the industry). The key benefits of the agricultural commodity blockchain platform recognised by the industry are: (1) simplicity; (2) security; (3) efficiency and (4) consistency. Through automating manual processes other benefits arise such as reduction of rekeying entries and decreases in error rates. In our example platform, a reduction in error rates would also enable future external participants (e.g. trade finance providers) to place greater trust in trade execution elements potentially undertaken within the expanding DLT platform; 
- a platform keeping its own data clean, secure and private can prevent issues relating to duplicate data where data management is delegated; N/A
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<td>Q9 In what ways can parties reach an agreement through their interactions on a distributed ledger?</td>
<td>If designed with high speed data movements, this speed can be a true benefit of a DLT; and ecosystem collaboration, seamless interactions and increased visibility in previously obscure segments of complex supply chains. (Please note that these comments are primarily limited to the current features and functions of the platform. As smart contract functionality is embedded into the platform, we anticipate that further efficiencies can be realised as elements of the contracts auto-execute, evidences (such as bills of lading) are automatically released to counterparties, payment instructions issued (or payments released from escrow) and letters of credit processed). The concept has been proven on Blockchain trade finance platforms, such as Contour or eTrade Connect in the Hong Kong market, and Komgo which is built on similar technology to Covantis. It would also be worth considering the features in we.trade but we are less familiar with that platform.</td>
</tr>
<tr>
<td>Q10 Are you aware of programme languages which are specifically designed to enable parties to reach agreement on a distributed ledger? If possible, please give examples of the circumstances in which they could be or have been used.</td>
<td>In relation to additional costs, like any new solution, there will be an upfront investment in technology, a requirement to manage process &amp; behavioural changes (including training) and potentially an impact on headcount as technology efficiencies reduce manual tasks and associated human-resource requirements. These costs would be addressed in the overall business case and ROI.</td>
</tr>
<tr>
<td>Q11 Do you consider that offer and acceptance can occur through the operation of autonomous computer programs deployed by the parties on a distributed ledger?</td>
<td>In the example of the agricultural commodities platform referred to above, contract formation, at present, occurs outside the platform in the form of natural-language agreements. In the use-case we have described, the smart contract components of the platform could recognise, execute, and record certain conditions of the contract using the Blockchain.</td>
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<tr>
<td>(1) In what circumstances? (2) on what legal basis?</td>
<td>In other circumstances (referred to above), we believe that an offer made by one counterparty can be autonomously accepted by another counterparty – e.g. the offer to acquire a particular asset or commodity (or package of assets/commodities) at a certain trigger price or specific time-point (indeed the use algorithmic trading platforms is widespread across global financial markets for a range of liquid assets).</td>
</tr>
<tr>
<td>Q12 How common is it for parties to enter into smart contracts on a DLT system without knowing each other’s real identities and in what circumstances is this likely to arise?</td>
<td>As stated above, our use for global agri commodities relates to permissioned systems where the parties interacting with each other will know the identity of the counterparty or counterparties.</td>
</tr>
<tr>
<td>Q13 What evidence might be available to a court to establish the identity of the parties to a smart contract entered into pseudonymously on a DLT system?</td>
<td>We have not commented on this in detail, but it is worth noting that increasingly financial markets for trading in crypto-assets require initial KYC and AML checks on participants before granting access to platforms. Thus whilst the parties may trade using a pseudonym on the relevant platform, the platform administrator shall have a record of the identity of participants.</td>
</tr>
<tr>
<td>Q14 Are you aware of, or do you foresee, any difficulties in applying the law on consideration to smart contracts? If possible, please provide examples.</td>
<td>See above answers: contract formation is not part of the smart element of the DLT platform referred to in our agri-commodities use case.</td>
</tr>
<tr>
<td>Q15 Are you aware of, or do you foresee, any difficulties in determining whether the parties to a smart contract have reached a certain and complete agreement? If possible, please provide examples.</td>
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<td>Question reference from call for evidence</td>
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<tr>
<td>Q16 Are you aware of any instances where the parties to a smart contract have expressly agreed that they do not intend to create legal relations?</td>
<td>Yes.</td>
</tr>
<tr>
<td>Q17 Do you foresee any difficulties in ascertaining whether parties intend to create legal relations when they transact with one another on a distributed ledger?</td>
<td>Yes.</td>
</tr>
<tr>
<td>Q18 Do you consider that source code could meet the definition of “writing” in the Interpretation Act 1978?</td>
<td>Our view is that an amendment to the Interpretation Act 1978 would be preferable whilst allowing for contractual freedom to deviate from the definition or treatment of source code.</td>
</tr>
<tr>
<td>Q19 Do you consider that parties can “sign” an agreement recorded solely in code? If so: (1) are you aware of technologies that are currently in use or under development to facilitate the signing of agreements recorded solely in code? (2) please provide any examples from your experience where the parties have signed an agreement solely in code.</td>
<td>As above, in our experience, the most common use of smart contracts is of a natural language contract, signed by the parties electronically or in wet-ink, in which some of the contractual obligations are performed automatically. As contract formation and terms are documented using natural language, these smart contracts (where only performance is automated) can use eIDAS compliant AES and QES in the usual way.</td>
</tr>
<tr>
<td>Q20 Do you think that smart contracts using DLT are currently able to utilise eIDAS compliant advanced electronic signatures and qualified electronic signatures? If not, how do you think they could be designed to accommodate these types of signatures?</td>
<td>We currently take a conservative approach to transactions involving deeds and would not advise this use cases, and noting current restrictions around HMLR recognition of</td>
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<td>performed by, or recorded in, computer code deployed on a distributed ledger?</td>
<td>deeds for the transfer of title in land (and potentially HMRC in respect of evidencing transactions for tax purposes).</td>
</tr>
<tr>
<td>Q22 Do you consider that a deed recorded partly or wholly in code can satisfy the statutory formality requirements applicable to deeds and address the implications of the Mercury decision?</td>
<td>See above</td>
</tr>
<tr>
<td>Q23 Are you aware of, or do you foresee, any difficulties in applying the principles of interpretation to identify whether terms of a particular smart contract are contained in the natural language component or the coded component of the smart contract or both?</td>
<td>We foresee disputes where code is hacked and changed so that the smart element can be manipulated: any flawed logic or insecure implementation could be fertile ground for disputes and lead to claims for rectification</td>
</tr>
<tr>
<td>Q24 In what circumstances might disputes arise about the proper interpretation of the coded terms of a smart contract? Please provide examples where possible.</td>
<td></td>
</tr>
<tr>
<td>Q25 Do you consider that the meaning of a coded term of a smart contract would or should be determined by asking what the term would mean to: (1) reasonable person; (2) reasonable person with knowledge of the relevant code; or (3) functioning computer?</td>
<td>Our opinion is that (3) is too problematic</td>
</tr>
<tr>
<td>Q26 Do you consider that performance of the coded terms of a smart contract cannot always be predicted based on a reading of the code? If so, can you provide examples or specific evidence of this occurring?</td>
<td></td>
</tr>
<tr>
<td>Q27 What practical or procedural steps could the courts take to resolve disputes about the interpretation of the coded terms of a smart contract?</td>
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<tr>
<td>Q28 Are parties utilising natural language in smart contracts to make their intentions clear in respect of any coded terms or the contract as a whole?</td>
<td>This is problematic as contractual negotiations are unlikely to go to the operational elements of a permissioned system where only particular steps are &quot;smart&quot;.</td>
</tr>
<tr>
<td>Q29 In what (if any) circumstances should courts be able to consider evidence of the parties' pre-contractual negotiations as an aid to interpretations of the coded terms of a smart contract?</td>
<td>An approach based on not rewriting terms but holding parties to their contractual bargain is probably at the current time the best approach to take, encouraging commercial parties to ensure their contract terms and remedies are rigorous enough to cover the potential for miswritten code. For contracts that can be formed automatically on a permissionless system, there may be some advantage to ensuring pre-contract information is given or able to be viewed (adopting a similar approach to the Provision of Services Regulations 2009 but more succinct). Requiring a natural language translation of any automated step could be an option, although this might result in the advantage of a smart system being dissipated.</td>
</tr>
<tr>
<td>Q30 Do you consider that the courts' current approach to contractual interpretation might cause problems in the context of smart contracts? If so: (1) Can you provide examples or specific evidence of this occurring? (2) What could be done to solve these problems?</td>
<td>This will depend on why the terms need rectification: see comments above on cyber breaches and bad design.</td>
</tr>
<tr>
<td>Q31 Are you aware of, or do you foresee, any practical difficulties in ordering rectification of the coded terms of a smart contract? If so, do you think that parties to a smart contract will, in practice, seek rectification?</td>
<td>Mistake will be difficult to argue in a permissioned system.</td>
</tr>
<tr>
<td>Q32 Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether the parties have made a common mistake when entering into a smart contract?</td>
<td>Mistake will be difficult to argue in a permissioned system.</td>
</tr>
<tr>
<td>Q33 What steps or precautions (if any) do parties typically take before entering into a smart contract to satisfy themselves that the code will execute as intended?</td>
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<tr>
<td>Q34 Do you consider that the legal principles concerning unilateral mistake might need to be adapted to accommodate smart contracts concluded by computer programs without human intervention? In particular: (1) is it appropriate to confine a unilateral mistake to a mistake about a term of the contract? (2) what test should the court apply in determining whether the non-mistaken party had knowledge of the mistaken party’s mistake? (3)</td>
<td>If the structure adopted is a permissioned system where contract formation and contract terms are agreed outside the smart element of the contract, then the use of code to execute particular steps or processes is effectively an agreed and accepted delegation by the contract parties or participants of their own actions: they have agreed that the code is to apply provided the circumstances are met when the code is to be “activated”. In that sense, the mistake is not of the parties but of the programming and therefore the doctrine of mistake should not be applied to the incorrect application of the code.</td>
</tr>
<tr>
<td>Q35 Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether a smart contract has been entered into as a result of a misrepresentation?</td>
<td>Our opinion is that the existing law of misrepresentation will not apply to incorrect execution of code and we agree with paragraph 5.61 of the call for evidence.</td>
</tr>
<tr>
<td>Q36 Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning rescission to smart contracts which have been vitiated for misrepresentation, duress or undue influence?</td>
<td>If the position cannot be returned to because of multiple participants in the chain, then rescission is always going to be problematic. The reality is that the benefit of smart contracts and blockchain mean to some extent that participants will lose the benefit of potential remedies such as restitution – because by participating in the system, they are acknowledging the decentralised nature of the system. Where there is one central operator of the system, these remedies may still be available. Duress and undue influence would be better addressed through specific consumer protection legislation potentially with clarification for individuals who are frequent traders or investors (although we accept that these can occur also in a B2B scenario, they are less likely).</td>
</tr>
<tr>
<td>Q37 Are you aware of, or do you foresee, any difficulties in awarding damages for breach of contract where the terms of a natural language contract are performed automatically by computer code?</td>
<td></td>
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<tr>
<td>Q38 Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning termination where the terms of a</td>
<td>Automatic termination may have consequences where it interacts with insolvency legislation.</td>
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<td>natural language contract are performed automatically by computer code?</td>
<td>There may be difficult questions around force majeure: force majeure relief may be triggered but the smart elements carry on self-executing.</td>
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<tr>
<td>Q39 Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning breach of contract to contracts recorded wholly or partly in computer code?</td>
<td></td>
</tr>
<tr>
<td>Q40 Are you aware of, or do you foresee, any difficulties in applying the law on frustration to smart contracts?</td>
<td>This will depend on the extent of user and access terms: if there are none we can see a scenario where frustration might be argued but where there are comprehensive terms, we would expect the courts’ current approach of applying these terms as “ousting” arguments of frustration to apply</td>
</tr>
<tr>
<td>Q41 Can you provide examples of terms that parties have included (or might include) in the natural language element of the smart contract to address the risk that subsequent events might affect the performance of the code? Please explain: (1) the drafting of the provision; (2) the subsequent events covered by the provision; (3) the effect, under the provision, of the subsequent event on the contract; and (4) the remedies available to the parties under the provision.</td>
<td></td>
</tr>
<tr>
<td>Q42 Are you aware of, or do you foresee, any difficulties in applying the illegality doctrine to claims made in relation to smart contracts?</td>
<td>In addition to issues of anonymity of participants, problematic would be any requirement for conduct to be involved. For example a platform set up pre sanctions or export controls could execute transactions legally but a subsequent sanction or control would make the furtherance of that transaction illegal: the participants have not committed any act but may have traded with a sanctioned person</td>
</tr>
<tr>
<td>Q43 Are you aware of any business to consumer smart contracts currently in use or in development? Please give details.</td>
<td>We have not advised in this context</td>
</tr>
<tr>
<td>Q44 When would you estimate that smart contracts might be in common use in business to consumer contracts?</td>
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<td>Q45 What challenges do you foresee in applying consumer protection laws to consumer contracts entered into wholly or partly in code? Are there any additional existing protections, beyond those we have discussed, which you think are or will be particularly important in the smart contract context?</td>
<td>The challenges will be around whether a consumer has had a clear explanation of any self-executory elements. The law on unfair practices may need to be developed further in this respect.</td>
</tr>
<tr>
<td>Q46 What, if any, additional protections do you think are required for consumers entering into smart contracts? In particular, do you consider that there is a case for an explicit legal requirement that terms of a consumer contract which are fully or partly in code must be explained in natural language before the conclusion of the contract?</td>
<td>We agree that terms of a consumer contract which are fully or partly in code must be explained in natural language before the conclusion of the contract. That said, even an explicit legal requirement for explanation may not go far enough for certain classes of consumers (e.g. vulnerable customers). Break rights may also be needed.</td>
</tr>
<tr>
<td>Q47 Are you aware of, or do you foresee, any difficulties in identifying the place of formation of a smart contract?</td>
<td>We anticipate that most arrangements between sophisticated counterparties will include specific provisions which specific governing law/jurisdiction. For permissioned systems where participants sign up to terms of use or access, a default position can be agreed in those terms. For those who use systems without knowing the identity of their counterparty, the use of domicile outside agreed jurisdiction clauses, seems to be the best option: in a B2B context, it is then at the risk of the participant as to how far it wishes to contract with an unidentified participant.</td>
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<tr>
<td>Q48 In what circumstances do you think that jurisdiction to hear a dispute in relation to a smart contract could be based on the actions and location of an agent?</td>
<td></td>
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<tr>
<td>Q49 Do you think that a rejection of state law in favour of the rules contained in the platform’s protocol is or should be a choice that can be given effect to under article 3(1) of the Rome I Regulation?</td>
<td>It might be preferable for legislation to make clear the extent of the phrase “contractual obligations” and to answer the question whether the choice of the protocol is allowed to override a state’s mandatory provisions of law.</td>
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<tr>
<td>Q50 Can an express choice of applicable law be embodied in computer code? If possible, please</td>
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<td>provide any practical examples of a coded clause expressing a choice of applicable law.</td>
<td>Answer</td>
</tr>
<tr>
<td>Q51 What factors are capable of connecting a smart contract to a particular jurisdiction, for the purposes of article 4(3) and 4(4) of the Rome I Regulation?</td>
<td>The question could be posed where performance would have taken place if the smart element had not been activated</td>
</tr>
<tr>
<td>Q52 Are you aware of, or do you foresee, any difficulties in the context of smart contracts in applying the choice of law rules that apply under the Rome I Regulation to contracts of carriage (article 5), consumer contracts (article 6), insurance contracts (article 7) and individual employment contracts (article 8)?</td>
<td>Our opinion is that this would be better if clarified by legislation and be part of pre-contract information requirements. This type of automation goes directly against inclusivity initiatives for particular groups of individuals</td>
</tr>
<tr>
<td>Q53 Do you think that a rule of jurisdiction based on the place of contractual performance can be applied where the performance takes place on a distributed ledger?</td>
<td>Answer</td>
</tr>
<tr>
<td>Q54 What factors do you think are capable of connecting a claim in relation to a smart contract to a particular jurisdiction?</td>
<td>Answer</td>
</tr>
<tr>
<td>Q55 Which, if any, rules for establishing jurisdiction do you consider will be most problematic in the smart contracts context? Do you agree with our analysis of the issues as described in this call for evidence?</td>
<td>Answer</td>
</tr>
<tr>
<td>Q56 Are there any issues we should be considering on smart contracts beyond those we discuss and ask about in this call for evidence?</td>
<td>The issue of security weaknesses and potential future certification frameworks aimed at DLT</td>
</tr>
<tr>
<td>Q57 Which other jurisdictions should we look to for their approach to smart contracts, and why?</td>
<td>It may be that international conventions on the sales of goods develop in a way that makes them a better fit for smart contracts. We are also interested to explore the development of Incoterms in the context of international sale of goods where fulfilment is managed (in whole or in part) by Smart Contracts.</td>
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<tr>
<td>Q58</td>
<td>Are there any legal reforms that you consider immediately necessary to remove uncertainty and unlock some of the potential benefits and cost savings of smart contracts?</td>
</tr>
</tbody>
</table>
Response ID

Submitted to Law Commission call for evidence on smart contracts
Submitted on

About you

What is your name?

Name:
Florian Idelberger

What is the name of your organisation?

Enter the name of your organisation:
European University Institute; Law Department.
ifrOSS, Institute for Issues of Free and Open Source Software

Are you responding to this consultation in a personal capacity or on behalf of your organisation?

Personal response

If other, please state:

What is your email address?

Email:

What is your telephone number?

Telephone number:

If you want the information that you provide in response to this consultation to be treated as confidential, please explain to us why you regard the information as confidential. As explained in our privacy notice, we will take full account of your explanation but cannot give an assurance that confidentiality can be maintained in all circumstances.

Please explain to us why you regard the information as confidential:

Not necessary.

Chapter 2: What is a smart contract?

Question 1

Please share your views below:

To a large degree, many contractual obligations are already partially automated. Often, however, while the actual changes in data, actions taken on a service or options traded are in some way automated or at least take place without human intervention, they are often still governed by a kind of 'framework agreement' and in many cases the assumption is that in case something unforeseen happens, the outside framework agreement can then overrule the automation and by manual intervention a party is made whole or similar.

Generally, automation of some form is possible and easier, if some or all of the data generated during the contracts' lifecycle is digitally accessible and verifiable.

For this reason financial contracts were the first to step in the direction of automation, both with and without distributed ledgers.

In some cases, such as disputes, the automation can still call for help to take into account hardship clauses or similar.

Question 2

Please share your views below:

Yes, as they are currently the only systems allowing for proper open access and interoperability. And contracts/contractual obligations of any sort should be freely accessible without being bound to a specific vendor.

Question 3

Please share your views below:

Permissioned DLT systems can be best if a closed group of entities want to keep a shared ledger, on which they for example keep or trade assets, but in cases where they do not actually want as much corporation to integrate IT systems in another fashion. Another example would be if a group of stakeholders for example
want to record audit information or similar, then they could make the permissioned system available to the public for reading only. For all and most other system, permissionless systems are preferrable, as many of the benefits of shared ledgers such as robustness and interoperability only really matter in a permissionless system.

Regarding issues raised in the consultation - barring a malfunction, permissionless systems can also feature contracts that can be told to stop. In Ethereum's case for example generally the 'owner' or creator of a contract has the most rights. Similar to how contract law functions today, it is always possible to correct the outcome later.

Similarly, the pseudonymous identity of permissionless systems is not a necessity. In fact many addresses can be tied to identities, and it would definitely possible to limit certain actions to specific verified adresses, while still overall being permissionless.

Regarding being able to see transactions on a ledger, that is precisely one of the benefits, and it should be noted that different to what is stated in 2.27 (3), information in a public ledger is not generally encrypted unless specifically encrypted elsewhere. A permissioned system might try to enforce greater secrecy, but if such a level of secrecy is required, a traditional shared ledger or database system is preferable. In any case, even permissioned systems only make sense in my view if there is at least a 'trinity' of administrators, ideally much more. Otherwise they are just a waste of money.

Question 4

Please provide examples of how these forms of smart contracts have been used in practice:

Most of the time, smart contracts as code version are developed independently. For one reason because their programmers do not usually have the expertise to draw up a legal contract at the same time, and furthermore as they are much more concerned with the functioning of their contract, and the legal version does not help with that. If there is an accompanying natural language contract or an accompanying framework contract it is generally drawn up indepedently.

Question 5

Please share your views below:

As far as I am aware, there is no direct interaction between natural language and machine readable parts. In the original ricardian contract system for example, the contract as a document and some key 'data points' as well as a cryptographic key for authentication were machine accessible, but all substantive clauses beyond that were not.

In current incarnations of hybrid smart contracts, the most common interaction is that certain blanks in a contract are connected to data points or functions of a smart contract, which then enables to launch functionality from the natural language contract and update data points in the natural language contract automatically.

Question 6

Please share your views below:

1. First there would be an analysis of what those obligations are, and subsequently if it makes sense to encode these. If yes, and this makes only sense beyond a certain size, duration of activity of the contract, then an expert programmer or legal engineer would have to encode this contract. The specifics depend on the system used. For a hybrid contract, it is more likely that its system comes with tools to allow access for non-programmers such as specialized lawyers, but otherwise the drafting (before or after the technical part) would be the same as for natural language contracts, with the caveat, that drafters and parties should be aware of the limits of automation. Especially in distributed ledgers, but also in other systems, when some fact or subjective interpretation is not accessible by the system, it cannot reasonably be automated.

Question 7

You already mention many popular examples, others include the creation and sale of digital art and gaming related items. Their benefit is that they are easily tradeable as opposed to traditional gaming items, which are prohibited to sell.

Apart from that, general contract digitalization does also make sense, but it is seldom useful to put it on a distributed ledger, whether permissioned or not.

Question 8

Ideally, smart contract can provide improved legal certainty, speed and less ambiguity, or at least focus the vagueness and ambiguity on parts where it exists on purpose. Their greatest asset however is interoperability, in the sense that important securities or similar would automatically be auditable and assuming the owner allows, could be interacted with by anyone, ensuring access beyond the lifetime of their creator. (on a publich distributed ledger, assuming the creator did not take measures against this)

This would be important to diversify risks as increased interoperability and transparency would herald a new era of business through new revenue streams and prevention of costly bailouts, if malicious practices are noticed early.

Chapter 3: Formation of smart contracts

Question 9
Currently, either one party can submit / 'deploy' a smart contract that either constitutes an expression of will, which cannot take money from anyone but e.g. can grant rights or tokens to certain accounts.

In case of actions or legal obligations for which a second party is needed or needs to assent, and this is preferable, once part A has deployed, party B can sign/signal agreements.

In more complicated arrangements, a voting system or signature requirements by multiple parties can be implemented. All the above was about signature and formation. Whereas for drafting, parties can signal for specific options that are pre-coded (if these are provided for), but otherwise they will have to be agreed in a separate drafting process beforehand.

Question 10

Please share your views below:

Solidity, Lexon, Vyper.

Solidity and Vyper are e.g. heavily used in the Ethereum eco-system and especially in decentralized finance.

Lexon and similar projects like Logical English are attempts to employ natural language - like languages that are automatically translated into executable smart contracts, provided certain guidelines are met. (e.g. demo.logicalcontracts.com)

Question 11

Please share your views below:

It depends. If a person with legal capacity automates the use of their account, for example by granting their private key to a program, then this could result in valid offer and acceptance, especially if the owner previously once assented personally. This could e.g. be compared with high frequency trading, where, subject to certain regulations and conditions, automated offer and acceptance happens all the time.

However, it should be noted that due to the public and limited nature of programs deployed on distributed ledgers, most of the time such autonomous programs/agents would not run on the distributed ledger, but on a separate machine, and then only interact with the ledger to carry out transactions.

Question 12

Please share your views below:

Very common, at least on a public system. To stay with easily imaginable financial contracts, if the smart contract managing a decentralized exchange matches two orders, the seller and buyer normally will not know each other's identities.

Question 13

Please share your views below:

In any system with sufficient ties to the real world and significant accounts of total volume, accounts will always have ties to choke-points such as exchanges selling cryptocurrency for fiat currency or shops which sold sth to someone. In both cases identifying information could be obtained, more so in the exchange case due to KYC and AML legislation.

Furthermore, analysis of transaction data can further give insights into potential identities.

Question 14

Please share your views below:

No. (specific edge cases might arise but just as in giving a gift is not preventable in ordinary life.) It is not enforceable, but that does not mean it does not happen.

Question 15

Please share your views below:

No.

Question 16

Please share your views below:

No. Though in some cases it might be obvious, where e.g. a nonsense code or simple message in embedded.

Question 17

Please share your views below:

This might depend on what you define as legal relations. Can you transfer money or expect to acquire ownership or accrue interest without legal relations? If yes, then there might be more difficulties. If not, then it depends more on the user interface that most people will use for interactions, as thus is a question of design, usability and accessibility.

Question 18
Please share your views below:

This is not my area of expertise as I am not trained as a UK legal professional, but just on the face of it, it could certainly, as the act does not (as far as I can tell) make reference to 'natural language' or human language or anything similar but simply refers to 'words or figures' in visible form, and how would one argue that this does not apply to source code?

Question 19

Please share your views below:

Yes.

For one thing, the study on use of qualified electronic signatures see here:

Otherwise, assuming ordinary electronic signatures are tied to an identity, they could also provide a way to sign and then this happens all the time on electronic marketplaces using agreements purely recorded in code and/or as data.

Question 20

Please share your views below:

In principle yes, such as tested here:

However some of the benefits of smart contracts in distributed public systems would be removed if a central authority for authentication/signature is inserted as an intermediary.

So they can certainly be accommodated. However, as the existing signatures used for smart contracts are already equivalently secure, it would be more appropriate to either recognize that or just tie f.e. a certain address/private key of a distributed ledger to a qualified electronic identification, thus enabling both with minimal effort. (or f.e. a private key stored on a eIDAS compatible device could be used directly to sign a distributed ledger transactions.

Question 21

Please share your views below:

No.

Question 22

Please share your views below:

As far as electronic signatures satisfy the requirements of the mercury decision: yes. But as far as I can tell electronic signatures were not considered in this decision and thus cannot satisfy the requirements. The only possibility might be if a separate document or image is uploaded somewhere and through an electronic content address and hash tied to the coded contract. However it is uncertain whether that would be satisfactory and would ultimately be up to the courts or the legislator.

Chapter 4: Interpretation of smart contracts

Question 23

Please share your views below:

Well, this very much depends on the language and technology applied. If a contract only uses a programming language, assuming a person can read and test it, they can determine the output relatively exact. If the person cannot read or test the contract or in case it is written in a language that leaves room for interpretation, problems might arise but then the principles of interpretation could be applied analogously, for example checking intent and congruence with surrounding communications.

Question 24

Please share your views below:

In cases there is a coded version and a natural language version and they differ. Such as the coded one being more specific, as an example the natural language version could say 'payment should be made in appropriate manner' but the coded version only specifies payment via one specific method.

Question 25

Please share your views below:

If the term is only in a coded form, without visual or natural language representation, it does not make sense to determine by reasonable person, as it would not mean anything.

Similar to online platforms, where the specific actions are also determined / governed by code (though also surrounding terms and conditions exist) either the actions of the interface or the code (in conjunction with the terms and conditions and regulatory principles to determine illegal conduct) should be most relevant, either evaluated by a person with knowledge, a computer or a reasonable computer user.
Question 26

Please share your views below::

In principle, it can be predicted. It might only be unpredicable if the inputs are not known or not in range, i.e. the writer of the contract did not account for certain inputs or does not check for valid inputs. In most cases the contract would just fail to execute such an action. However f.e. if it relies on external data and that data is unreliable or faulty, actions can be wrong. An example can for example be a price feed for a stock or security, with the contract performing actions based on prices, such as calculating other prices or values. If the data is wrong, the prices calculated from that and any subsequent actions could be wrong. This is similar to conditions in general automated trading, where even if the algorithm is correct, if it gets wrong data from a marketplace, its resulting actions could be wrong.

Question 27

Please share your views below::

Depending on the native environment of the smart contract, either expert witnesses could be called or the contract deployed in a 'test environment' run on a single computer. However in most cases this is likely not necessary as it could simply be asked, what happened, what did the claimant expect to happen, did the have a reasonable expectation for this to happen and if there is a defendant, do they have a reasonable explanation for any discrepancies?

Question 28

Please share your views below::

In most cases where the contract only exists as code or is part of a larger system, the natural language for example in comments in the code is used in respect of the coded terms. Whether these constitute the whole (written) contract or terms and conditions etc exist depends. It is however also possible to write contract in a declarative natural language that merges code and natural language.

Question 29

Please share your views below::

In case there are significant discrepancies, there pre-contractual negotiations and communications should always be used to interpret the contract and any preceding offer and acceptance. As an example, in the case of a smart contract based security, where the issuer later claims that certain guarantees or terms where not offered, previous communication to the public (to the contrary) should be taken into consideration.

Question 30

Please share your views below::

Well, smart contracts at least in current implementations are much close to financial trading algorithms or social media platforms. Only that the financial trading with smart contracts is largely public as opposed to financial trading algos and that they transact with much higher values than social media platforms. As a solution, courts should adopt a more holistic interpretation re intention (such as looking towards marketing documents and any other documents that might be evidence of intention) and look towards how this is handled in financial trading and platform regulations.

Chapter 5: Remedies and smart contracts

Question 31

Please share your views below::

This can only be answered sufficiently based on a specific technical system. But assuming a public smart contract system, in most sufficiently advanced usage, there is always the possibility to upgrade/change contracts, perform restitution out of band or similar. This is assuming identities are known, but this is anyway a precondition for bringing any judicial action. Generally, I think in many cases parties will not seek rectification often, as similar to other platforms, if alternative means of dispute resolution can be used, these are quicker and less costly, and to some degree loss of fund is accepted as inherent risk (similar to stock trading).

Question 32

Please share your views below::

No necessarily. Though due to the subsequent nature of smart contracts in existing systems (it is first deployed and then signed by additional parties), common mistakes are extremely unlikely in my opinion.

Question 33

Please share your views below::

This again depends on the system - among others - verification of network parameters (connection), target address, contract parameters, and supplied fees are often checked. In more special cases, the code at the targeted address could be verified against public records of code, to see if it matches the know entity and contract one want to contract with.

Question 34
Please share your views below:

I do not think in transactions between smart contracts unilateral mistakes are a concern, as either the transaction would fail, or the creator of the transacting contract is at fault.
As asked, these are much more likely to occur for humans interacting with smart contracts. In these cases not only the term should be looked at, but the whole interaction, including user interface and marketing materials, as it is much more likely for users that they are led astray due to bad interface design for example.
A good test for example would be, whether the non-mistaken part intentionally or negligibly let confusing interface design or contract clauses be, even though it was aware of problems.

Question 35
Please share your views below:
I am not currently aware of any problems.

Question 36
Please share your views below:
Most problems would occur in actually deriving what happened, and by whom. Once that is done, the rest should be unproblematic.

Question 37
Please share your views below:
No. Assuming parties are known, like in other transactions, assuming a contract does not provide for damages, the court can specify damages again a natural or legal person as it normally would, and then enforce that. It should not bow to the fallacy that the contract has agency (as some have suggested) and therefore needs to be able to convey damages.

Question 38
Please share your views below:
No. With additions as above under damages.

Question 39
Please share your views below:
No.

Question 40
Please share your views below:
Not any more or less difficulties than generally terminating or awarding damages. The most likely event to be a problem for current smart contracts is regulation outlawing certain kinds of trading in a specific jurisdiction.

Question 41
Please share your views below:
Nothing to share at this point.

Question 42
Please share your views below:
Same as question 40.

Chapter 6: Consumers and smart contracts

Question 43
Please share your views below:
As an example, I would consider most decentralized exchanges such as Uniswap to be consumer facing.

Question 44
Please share your views below:
In the world of decentralized finance they already are. In other areas, it take long or they might never be in widespread use due to it not making any sense.

Question 45

Please share your views below:

Similarly to what is discussed with regard to AI ethics, platform regulation and financial regulation I think most important is an obligation of transparency regarding the calculation used, risks involved and the participants and their interests. This is partially already done for example for decentralized exchanges, but not always. I think a big problem could be the distinction of delineating who actually counts as consumer and who does not. If someone is a self-made trader, living of his stock trading earnings, does he qualify as a consumer?

Apart from that, distance selling regulation could be applied normally in case sth is sold, or finance regulation for finance (but might be difficult as what if there is no legal entity?).

Question 46

Please share your views below:

I think that would be a good requirement. In most cases this will be the cases, though not necessarily in natural language, but potentially also through illustrations and similar methods. These should also be valid, assuming they are sufficiently clear and certain.

Chapter 7: Jurisdiction and smart contracts

Question 47

Please share your views below:

Yes. Though at least once all parties are known, rules could be applied analogously to contracts concluded over the internet.

Question 48

Please share your views below:

In case agents are clearly identifiable.

Question 49

Please share your views below:

Potentially yes. Though as far as I am aware there is no precedent for this, and it would be a new kind of private law-making, because as far as I am aware, this provision only refers to countries.

Question 50

Please share your views below:

It can be, but so far I do not know of any examples. Merely Lexon is thinking of integrating this.

Question 51

Please share your views below:

Ip addresses / identities and residences of the parties and content of the contract. (such as when for a service in a particular area)

Question 52

Please share your views below:

No. Though for some of these I am not aware of smart contracts, so this might change in the future. Like always, the problems is mostly gathering the available data, such as about the parties, once that is established applying the regulation should be straightforward.

Question 53

Please share your views below:

Difficult, but that never stopped anybody. As in, for contracts concluded over the internet, it also does not matter that a server is located in neither of the parties’ jurisdictions.

Question 54

Please share your views below:

Same as in 51.
Question 55

Please share your views below:

Most problematic will be gathering all the evidence and maybe deciding whether a contract 'engine' such as a decentralized trading engine constitutes a perpetual offer/ if the entity behind it is to be seen as a party or not.

Chapter 8: Final questions

Question 56

Please share your views below:

No.

Question 57

Please share your views below:

Wyoming, Estonia, as these have some increasingly progressive proposals and laws.

Question 58

Please share your views below:

No.
1. INTRODUCTION AND TERMINOLOGY

1.1 Herbert Smith Freehills LLP welcomes the opportunity to comment in response to the Law Commission’s Smart Contracts Call for Evidence (the "Call for Evidence"). With a global team of 60 lawyers specialising in the delivery of future legal services and as a consortium member working on a large scale, publicly available smart contracting solution in Australia, we expect that smart contracts will form part of our delivery of legal services in the medium to long term. We hope to continue to work with the Law Commission as its strategy on smart contracts develops.¹

1.2 At the date of this response, the use of "smart contracts" both by individuals and companies is at a nascent stage. Whilst it is common for parties to use technology to facilitate their legal obligations, for example by making electronic payments or, more recently, transacting using digital assets such as cryptocurrencies and non-fungible tokens, it is uncommon for parties to use what we would consider to be legally binding smart contracts.

1.3 Notwithstanding this, we have spent several years developing our understanding of the technologies relating to and legal implications of smart contracts. Moreover, we have been approached by clients in numerous jurisdictions who represent key commercial sectors (including financial services, energy and technology) who are looking to automate contractual obligations and who anticipate that smart contracts will, to a greater or lesser extent, become part of their business in the short to medium term, with their complexity and breadth of such use growing over the longer term.

1.4 Our overarching view as espoused in our responses below is fourfold:

1.4.1 There may be significant practical difficulties in determining whether a contract written solely in code constitutes a legally binding and legally enforceable contract, particularly because of the difficulty in determining parties’ intentions to create legal relations.

1.4.2 "Smart contracts" can provide significant additional value to commercial parties, through substantial benefits (including ensuring certainty and timeliness of performance), structured data, cost-savings and reduced operational risk.

1.4.3 For legally binding smart contracts to function effectively in a commercial context, such smart contracts should contain natural language setting out, as a minimum, the key rights and obligations that cannot be meaningfully represented in code, or that the parties elect not to set out such rights and obligations in code. As such, parties must be supported in drafting, entering into and managing their smart contracts by multi-disciplinary teams comprised of legal and technological skillsets and suitable platforms and user interfaces.
1.4.4 Provided that commercial parties are adequately supported in entering into legally binding smart contracts, legal reform is unlikely to be required to enable such arrangements.

1.5 To mitigate the risks of entering into smart contracts written solely in code, we envisage that parties are more likely to seek to enter into smart legal contracts ("SLCs"), and whilst it is appropriate to consider a wider range of options when considering the legal framework, we believe it is important for any classification or characterisation of smart contracts to have due regard to this core commercial use as well as the edge cases. We have considered extensively what features SLCs should have to mitigate the risks associated with the transition to smart contracting and recommend the following:

1.5.1 SLCs should be expressed in natural language in a machine-readable or digital state, with the parties then electing to automate particular obligations;

1.5.2 SLCs should incorporate code through the creation of 'conjoined' terms, where coded instructions are 'joined' or 'paired' and can be read together with natural language, either:

(A) on a non-unified basis, where the automation expressed in code instructions does not necessarily need to mirror the entire logic of the natural language term; or

(B) on a unified basis, where the code is a direct representation of the logic and variables of the natural language provision,

and we believe there is room for both approaches, but that the former approach may provide a higher degree of flexibility;

1.5.3 SLCs should incorporate appropriate boilerplate provisions in natural language to mitigate the risks of incorporating code and to provide standard contractual boilerplate terms (such as governing law and dispute resolution clauses), and for each conjoined term, the parties should expressly elect whether the code or the natural language is the primary expression of that term (of course, where the same approach is desired for all paired terms, the express choice can be expressed for the contract as a whole); and

1.5.4 SLCs should be deployed on a sophisticated SLC platform, which appropriately supports both the natural language and coded elements of the parties' contract, provides a digital execution mechanism, and provides required levels of security, privacy and data governance.

1.6 SLCs with the features set out above do not fit neatly into the three forms of smart contract set out in the Call for Evidence for the following reasons:

1.6.1 whilst an SLC is most akin to a natural language contract, code joined with natural language will usually be incorporated into an SLC;

1.6.2 conjoined terms will usually express the same obligation or part-obligation in both natural language and code, rather than in only one of those forms as contemplated for a hybrid contract; and

1.6.3 whilst SLCs are likely to be deployed using distributed ledger technology ("DLT"), the use of DLT is not strictly necessary.

1.7 In our response, where we refer to "SLCs", we consider them to include the features set out in paragraph 1.5 above. Where we do not refer to SLCs, we have adopted the three forms of smart contract defined in the Call for Evidence. However, we consider those definitions should be narrowed as set out in paragraph 1.7.1 and relaxed as set out in paragraphs 1.7.2 and 1.7.3:
1.7.1 unless an element of automation has been agreed between the parties (and imported into the contract by the natural language election), a contract should not be deemed a smart contract – for example, if a party unilaterally implements a standing order or computer program to satisfy a payment obligation pursuant to a contract written entirely in natural language, the contract would not be a smart contract, though if the parties agree methods of performance based in shared computer programs it follows that the parties would benefit from bringing that shared automation into the contract so that issues associated with performance can be governed by the agreed terms of the contract;

1.7.2 a contract need not utilise DLT to be deemed a smart contract – as we explain below in paragraph 2.2; and

1.7.3 not all obligations in a contract need to be automated for the contract to be deemed a smart contract – only some automated performance is necessary.
2. CHAPTER 2: WHAT IS A SMART CONTRACT

2.1 What kinds of contractual obligations can currently be automated using computer programs? Please provide specific examples where possible [2.12].

As an important starting point, in our experience, and having spoken at length to several clients operating in various sectors (including financial services, energy and technology), we are not aware of any company having yet used an SLC to automate any of its contractual obligations with another party or consumer. However, we are aware of companies using smart contracts (the definition of which is much broader than SLCs) to help automate their obligations, as we explain in paragraph 2.7 below.

A contractual obligation of nearly any kind in an existing natural language contract can be automated (at least partially) using computer programs, or extended through digital connectivity (whether with internal systems or external data sources). We expect for the foreseeable future that parties will start with a machine-readable natural language contract or heads of terms, before carrying out a cost-benefit analysis to determine which obligations to automate.²

At this early stage, there are different methodologies and tools in the market for adding automation to contracts. Some methodologies and tools are highly flexible, others rely on the unified method (explained in paragraph 1.5.2 above) where the code and the natural language are highly connected. For these less flexible methods, in deciding whether to automate a particular obligation, parties must consider:

2.1.1 precision – a precisely worded obligation, with precise and predictable inputs and outputs, is well suited to the rigid nature of code required to automate that obligation; and

2.1.2 discretion – an obligation which requires discretion in its performance is less suited to automation – in some cases, it may be possible to remove the exercise of discretion by a human in favour of determining measurably (though oracles and potentially advanced machine learning models) what would satisfy a test of "discretion", but it is likely that automation of discretionary performance will constitute splitting the obligation into an automatable element and an element involving human intervention.

When flexible tools are used that do not require direct coherence between the code and the natural language, we see potential benefit in pairing automation (such as a simple automatic notification) with provisions that can contain elements of discretion.

Other considerations applicable to both unified and non-unified approaches include:

2.1.3 complexity – if an obligation requires a significant number of inputs, it may be more challenging to automate, although the reward in automating the obligation may be commensurately larger; and

2.1.4 administrative burden – an obligation which requires administrative tasks to be carried out, such as performing calculations, sending notices, processing ‘paperwork’, making payments or another activity which does not require supervision, is usually a good candidate for automation, noting that parties will also need to be comfortable with controls and intervention mechanisms, especially in relation to payment automation.

The cost-benefit analysis will change over time as the automation of particular kinds of obligations becomes more common and initial investment activity reduces. Other factors will also be relevant, including the costs and benefits of implementing or integrating oracles, implementing or making use of machine learning models and adopting a smart contract platform.

Additionally, it may be beneficial to automate aspects of contracts which might not traditionally be deemed obligations. For example, the execution of a contract could be automated (or partly automated) by including in the smart contract an automated way to process the electronic or digital signatures of the parties. However, we would not consider that automation of the execution process or an element thereof (of itself) would constitute sufficient automation for the contract to be considered a smart contract, because it does not relate to the contractual obligations within the contract.

The cost-benefit analysis may be resolved favourably for the following kinds of obligations: payments, calculations, notifications, triggering events like delivery orders, transfer of assets and reporting, provision of documentation (such as invoices, lists or records), maintenance of a register (for example, registration of persons having access to information under an NDA), registration of a state change (for example, allocation of warehouse space in real time) and verification of data.

Finally, we recognise value beyond automation of specific processes under the contract in terms of using the contract to generate and capture structured data for analysis and integration with broader business systems.

2.2 Do you agree that the Law Commission’s scoping study on smart contracts should be limited to contracts which use distributed ledger technology? If not, please provide details of other technologies which are used to support smart contracts, and their prevalence [2.26].

We do not agree that the scoping study should be limited to contracts which use DLT. A smart contract operates in the application layer of a smart contract platform’s technology stack, where users interact with the platform. DLT describes a method of storing and interacting with data, and operates at a lower (and conceptually independent) level of that technology stack. DLT as a method of data storing and interacting with data provides a variety of benefits, as explained at paragraph 2.23 of the Call for Evidence. There are, however, other methods which may be used to support smart contract platforms effectively. Many programming languages written to assist with developing smart contracts are written to allow portability across platforms and do not require DLT to exist in the technology stack.

A different approach may be to instead ask, what features should a smart contract platform have to best support the safe transition of the use of smart contracts? Members of our Digital Law Group recently co-authored a research paper entitled, ‘Digital Infrastructure Integrity Protocol for Smart Legal Contracts’ (“DIIP 2021”)3, which has been designed to act as a minimum set of requirements and recommendations for any high integrity digital infrastructure or Enterprise Platform (“EP”) intended to support SLCs. A well designed, private and permissioned DLT EP is well placed to meet DIIP 2021 requirements.

DIIP 2021 recognises that “contracts are a special class of asset that underpin both the economy and a well-functioning society. To this end there is a public interest in requiring high integrity EPs supporting contracts to adhere to a base set of requirements”, and that “lawyers with professional duties as officers of the court will be best able to meet those

duties if high integrity EPs are used commercially and by the public". The protocol sets out seven core requirements around:

2.2.1 confidentiality, privacy and permissioning;
2.2.2 access;
2.2.3 no change to contract without counterparty agreement;
2.2.4 data;
2.2.5 cybersecurity
2.2.6 portability, interoperability, reliability, availability and suspension; and
2.2.7 legal and jurisdictional issues.

We would like to work with the Law Commission, its global equivalents and the DIIP 2021 authors to further refine this important protocol.

2.3 When, and why, do parties to smart contracts decide to use (1) permissioned DLT systems and (2) permissionless DLT systems? [2.29]

Parties are likely to decide to use permissioned DLT systems where one or more of the following apply:

2.3.1 the identity of each party is important;
2.3.2 it is necessary, or required by law to consider directors' duties or other legal duties that will be engaged by privacy, data and cybersecurity requirements;
2.3.3 it is necessary, or required by law or regulation, to have recourse against a particular person, rather than relying on tracing through pseudonymised parties;
2.3.4 confidentiality of the contract and/or information to be exchanged in connection with the performance of the contract is a material consideration; or
2.3.5 a technical inability to override actions usually associated with existing 'blocks' on permissionless DLT systems is inappropriate or burdensome.

Parties are likely to decide to use permissionless DLT systems where the reasons outlined above are considered less material to the transaction. Smart contracts representing routine operations to be conducted en masse, with little or no negotiation and where the performance of both parties' obligations can be either discharged at the same time (or where the potentially pseudonymised party's performance can be discharged first as a condition to the other party's performance or secured by a trusted intermediary) can be suited to permissionless DLT systems. Examples include purchasing consumer goods, accessing basic infrastructure or exchanging digital assets (or digital assets for currency) on an exchange.

As most commercial and government transactions require some or all of the factors in paragraphs 2.3.1 to 2.3.5 above, we would expect, based on current technology, for these to be best served by permissioned systems.

2.4 Which of the three forms of smart contract discussed in para 2.32 of the call for evidence are most commonly used in existing smart contracts or smart contracts which are in development? Please provide examples of how these forms of smart contract have been used in practice [2.39].

As suggested in paragraph 1.5, our recommended approach for the implementation of smart contracts is to rely on a natural language contract as a starting point and then to
automate appropriate obligations in parallel, creating 'joined' obligations written in both
natural language and code. We describe contracts adopting this approach (and the
additional features outlined) in paragraph 1.5 as SLCs. SLCs could constitute 'natural
language contracts' as defined in paragraph 2.32 of the Call for Evidence, unless the
parties expressed an intention for the coded part of a conjoined term to determine the
parties' legal obligations, where it would not fit into any of the forms defined in paragraph
2.32 of the Call for Evidence.

Additionally, we recognise that:

2.4.1 it may not be possible to classify the whole of a contract in accordance with forms
of smart contract set out in paragraph 2.32 of the Call for Evidence or other
forms, as the form may change from obligation to obligation (or part of an
obligation);

2.4.2 an obligation may be written in both natural language and code; and

2.4.3 parties will need to decide whether to agree natural language terms that apply to
the operation of any code, and in so doing, whether to incorporate that code into
their contract.

Expressing an obligation in: (1) natural language with automated performance, or (2) in
both natural language and code with an expression of intended precedence, is most likely
to mitigate the risks associated with using smart contracts in the current regulatory
landscape in the UK, and may reduce the likelihood of a court being asked to interpret an
obligation written in code.

With the exception of the most basic contracts, we do not expect all express obligations in
a smart contract (i.e. those that would need to be included as express terms if the
equivalent contract were to be recorded as a natural language contract) to be written
entirely in code for the foreseeable future. We expect that, to the extent that parties come
to rely on the automatic performance of contracts, such parties will continue to express
their legal obligations in natural language to complement the code. The use of contracts
recorded solely in code would give rise to significant risks for parties, including concerning
enforceability, legal protection, risk, privacy and data control.

2.5 How do code and natural language interact in hybrid smart contracts currently in
existence or in development and which terms are generally coded? [2.40]

The code and natural language in hybrid smart contracts must interact appropriately at (1)
a legal level and (2) a technical level.

2.5.1 At a legal level, our recommended SLC approach involves supporting the parties
in making decisions about the legal and binding status of code and natural
language terms. There is not a one size fits all approach. If an obligation is written
in either natural language or code, as contemplated by the definition of a hybrid
contract in the Call for Evidence, or the parties have not specified how coded
terms and natural language terms should interact, there is potential for conflict
between the two. Any legal framework should preserve parties' freedom to
choose that, where a particular right or obligation is expressed both in natural
language and code, either the natural language term or the code should take
precedence, whilst also recognising factors such as:

(A) the inherent difficulty in giving effect to that choice if coded terms are
potentially deficient;

(B) the likelihood of a rapidly evolving "normal business practice" and
expectations of the parties; and
(C) the need for protection of consumers and others with weaker bargaining positions (as reflected currently in the Unfair Contract Terms Act and various consumer protection legislation, among others).

For an SLC or a hybrid smart contract, our view is that code may be legally incorporated into a contract, but we recommend that natural language is used to set out how the coded terms are treated, including whether the failure of code to run as expected gives rise to a breach of contract, or whether alternative manual means of performing the job the code was intended to perform will still suffice as performance. Such alternative performance may not be possible if an obligation is written only in code.

We propose that there are significant legal benefits to be gained by retaining natural language provisions in respect of obligations also expressed in code. This provides a practical solution to many of the issues raised in the Call for Evidence. Furthermore, it allows the parties to elect whether or not coded elements of the agreement between the parties should form part of the contractual record of that agreement. While retaining natural language and code may seem to create duplication, it actually provides maximum flexibility. In particular, bringing the coded representation of contractually agreed processes into the contract joined with natural language allows parties to agree the governance and processes around how the code executes, what happens in case of code failure, which party is responsible for the failure of a data source, and other contractual rights in relation to the performance of an underlying obligation.

2.5.2 At a technical level, smart contracts must be supported by sufficient infrastructure, including a smart contract platform, which must enable each smart contract hosted on it to be fully recorded and to have its performance appropriately managed and executed.

2.6 What process do the parties follow (or plan to follow) in negotiating, drafting and entering into a smart contract? [2.41]

At the outset, a useful SLC platform should not require the parties to follow any particular process in negotiating, drafting and entering a smart contract, nor should it require that parties make any macro whole-of-contract decisions about the inclusion or exclusion of code from the contract (or whether that code is binding). Parties should be able to negotiate, create or vary a smart contract (including both its coded and natural language components) in the same organic and iterative way that analogue contracts are currently negotiated and drafted. Parties should also be able to make decisions as to whether code is included and binding at the right (or obligation) level.

However, we note the practical reality that efficiencies may be gained by increasing reliance on standardisation of contract terms, particularly in cases where additional effort is required in drafting and testing coded provisions, above drafting traditional natural language clauses.

As multiple platforms develop and become established, there may be a place for platforms that place restrictions on some of the factors above, where that constraint is a consequence of seeking to provide a cheaper and/or faster option. The parties will effectively exercise their choice in relation to those matters when making their platform selection decision.

Please explain in particular:

2.6.1 Where all the contractual obligations are contained in a natural language agreement and the code is intended merely to perform those obligations,
the practical steps involved in coding the parties' rights and obligations contained in the natural language agreement.

The process for negotiating, drafting and entering into a natural language agreement is likely to involve first negotiating the natural language in the usual way independently of coding and automation work (though there is likely to be overlap as the nature of the natural language obligation will determine whether or not it can be codified (and vice versa)). Some parties may wish to enter into a contract on a smart contract platform which contains natural language provisions requiring obligations to be automated after the contract has been entered into. With our SLC approach, we expect cross-functional teams will work together to develop natural language obligations and either non-unified or unified coded obligations in parallel, most likely before the parties have entered into a contract.

The additional effort required in drafting and testing code is likely to lead to increased standardisation either in-house or across industries. We are already seeing a trend towards standardisation, for example, in the work done by the International Swaps and Derivatives Association in relation to the standardisation of common clauses in derivative agreements⁴ and OneNDA attempting to create standardised non-disclosure agreements through open-source collaboration.⁵ We anticipate that standardisation will lead to increased reliance on validated precedent clauses and negotiations following a more modular approach to drafting. We appreciate that it may be possible to re-use 'standard forms' of coded provisions, noting that this approach may be efficient but may also tend to cause code provisions to diverge from their natural language counterparts (which may or may not be a problem depending on whether the methodology supports a non-unified approach). It is more likely to be possible to re-use integrations built into smart contract platforms to allow the smart contracts to interact with other services, for example, oracle services and payment services.

For more bespoke clauses in contracts, logic flows and process mapping are likely to be a valuable stage in the process towards automation of clauses. Similarly, requirements gathering will need to be undertaken to understand the digital connections and processes with which the automations are intended to interact. Whenever coding work is undertaken, in accordance with the market standard approach in the software development industry, coders will need to understand the requirements to the smart contract agreed by the parties and the parties will need to account for coding work to occur as part of the timeline for negotiating and entering into natural language agreements or SLCs.

It is important to note that for this form of contract where code is merely method of performance, and hence external to the legal record of the agreement between the parties, it is effectively unilateral or internal code functionality and not shared automation between the parties in the way that such code and automation would be in a hybrid contract.

2.6.2 Where the parties intend that there will be a hybrid contract or a code only contract, the practical steps involved in drafting, negotiating and agreeing the code of the smart contract.

We expect the process described in paragraph 2.6.1 above to apply equally to hybrid contracts, notwithstanding the extent to which natural language may or may not be incorporated into a binding agreement.

2.6.3 Where there is a hybrid contract, whether the natural language element and the coded element are entered into contemporaneously or at different times.

Other than to the extent that some coded obligations may only operate at certain times during the contract, and to the extent that parties may wish to amend an agreement from time to time (or, for example, decide at a later point in time that a natural language obligation should be automated), we expect that the natural language elements and coded elements of a smart contract will be entered into contemporaneously. For an SLC, either:

(A) this will occur contemporaneously, as we would recommend; or

(B) the natural language contract will include obligations to finalise and implement the coded portions of the contract, with the substantive provisions being conditional upon such finalisation and implementation.

A lack of contemporaneousness could affect the binding nature of the agreement, even if the agreement includes obligations to finalise the coded parts, as there is a risk that the agreement to implement the coded parts would be unenforceable as an “agreement to agree”.

We note the parties to a contract will always have the freedom to amend the contract at any time by subsequent addition of automation and code through formal amendments to the contract.

2.6.4 The role played by third party service providers (such as computer coders and software firms) in this process.

As smart contracts are reliant on the operation of code, appropriately skilled technicians must play a pivotal role in the negotiation, drafting and ongoing management of smart contracts. Whether these skills are procured by a contract user from a third party will depend on the skill and sophistication of the user. At a minimum, it is highly likely that services of a digital platform will be required from a third party.

To translate natural language obligations or negotiations into code, parties may:

(A) employ their own coders;

(B) have coders be instructed as part of the role of their legal advisers (either acting on behalf of each party or via a joint instruction); or

(C) use (or have their legal advisers use) off-the-shelf contract-neutral tools which may require little or no coding skills.

It is unlikely that coders will be required to draft legal contracts in the medium to long term and that the availability of tools described in (C) above will be critical for the mainstream adoption of smart contracts.

There is currently strong and growing demand for workers with a mixed legal and coding skillset, this will be important in the short to medium term.

Parties should be mindful of the features, reliability and terms and conditions of their chosen platform. For example, the choice of platform may affect the parties’ ability to appropriately view (as a single source of truth), automate, amend, pause or keep confidential their agreement. Privacy and confidentiality terms of a particular platform are also key and will need to be considered as they relate to requirements within individual contracts.
2.7 Are you aware of any examples of use cases for smart contracts beyond those we give in the call for evidence, or variations on the use cases we give, which are being developed, are at proof of concept stage or are already operational? [2.64]

If so, please explain:

(1) the technology used to create the smart contract;
(2) the role played (if any) by oracles in the performance of the smart contract;
(3) the contractual terms (if any) performed automatically by computer programs; and
(4) whether the smart contract is a business to business commercial contract, a peer to peer contract or a business to consumer contract.

Other than those set out in the Call for Evidence, we are aware of very few proof of concept or operational use cases for smart contracts. For these use cases, it is often the case that either their automated aspects (or fact of unilateral automation by one party) would cause the solution to not be deemed a smart contract within the bounds of the definition set out in our introduction. To avoid doubt, the solutions we have listed below often support smart contracts which are neither SLCs as defined in paragraph 1.5 nor smart contracts as defined in paragraph 1.7. To the extent the below use cases or examples are of relevance to the current discussion, they fall into the following categories: the management of digital assets, decentralised finance, real estate transactions, index-based insurance and commercial contracting.

2.7.1 Management of digital assets

**Pyctor**

This is a decentralised digital assets post-trade market infrastructure for global custodians, institutional issuers and other capital markets actors. It is backed by ING, ABN, BNP Paribas, Citibank, Invesco, Société Générale, State Street, UBS and others, and offers smart contract management for issuers.

*Stage:* This platform conducted a pilot transaction in 2020 involving token issuance using a smart contract deployed on the Ethereum blockchain.

*Technology:* We understand that Pyctor uses public/private/hybrid blockchains such as Quorum, EOS, Ethereum, Hyperledger, Corda, Hedera Hashgraph.

*Oracles:* The extent to which Pyctor uses oracles is unclear from publicly available information.

*Automated contractual terms:* Information on automated contractual terms does not appear to be publicly available.

*Nature of contract:* Business to business.

2.7.2 Decentralised finance

**Aave**

This is a decentralised finance platform allowing users to lend and borrow digital assets.

*Stage:* This platform is operational.

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7 Aave <https://aave.com/>.
Technology: Deposited funds are allocated in a smart contract. The code for this contract is public and open source, and formally verified by third party auditors. The protocol allows anyone to interact with the user interface client, API or directly with the smart contracts on the Ethereum blockchain.

Oracles: The smart contract uses a price oracle.

Automated contractual terms: If a user interacts with smart contracts directly on the Ethereum blockchain, all contractual 'terms' are automated. If the user interacts with the smart contracts via Aave's website, an additional agreement in natural language governs the relationship between the user and Aave's website.

Nature of contract: Peer to peer.

dYdX

dYdX is a decentralised platform for margin trading in relation to cryptoassets. The protocols are comprised of open source smart contracts on the Ethereum blockchain.

Stage: The platform is operational.

Technology: We understand that the dYdX Margin Trading protocol uses one main Ethereum Smart Contract to facilitate decentralized margin trading of specific tokens.

Oracles: The platform uses a combination of pricing oracles, including from MakerDAO and ChainLink.

Automated contractual terms: Terms are automated in a similar manner to Aave, with all contractual 'terms' automated in Ethereum smart contracts.

Nature of contract: Peer to peer.

2.7.3 Real estate transactions

beNEXT

beNEXT is a legal technology start-up that is developing a multi-party smart legal contract for real estate agents and owners to use to manage the agency arrangement. beNEXT is a member of the Accord project. It is unclear whether the project is operational, and further information on it does not seem to be publicly available.

Norban Labs

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8 GitHub, 'Aave' <https://github.com/aave>.
12 dYdX <https://dydx.exchange/about>.
14 A Juliano, 6.
16 A Juliano, 6.
17 beNEXT <https://www.benext.io/>.
Norban Labs is part of a Swedish tech-enabled real estate agency and has built a working prototype to sell and transfer homes using smart contracts.\(^\text{18}\) We understand that it operates on the Ethereum platform, and mainly consists of Solidity contracts.\(^\text{19}\) Further information on this project does not appear to be publicly available.

### 2.7.4 Index-based/parametric insurance

**Arbol**

This is a parametric insurance platform which covers businesses in the agriculture, energy, maritime and hospitality industries against climate risks.\(^\text{20}\)

**Stage:** This platform appears to be operational.

**Technology:** The platform utilises smart contracts deployed on the Ethereum blockchain to make event-based outcome payments without intermediaries. Further information on the technology underlying the smart contract does not appear to be publicly available.

**Oracle:** The platform uses ChainLink oracles to provide data from the National Oceanic and Atmospheric Administration (NOAA) and other sources.\(^\text{21}\)

**Automated contractual terms:** The client chooses the index for loss at the beginning of their contract, and once an oracle confirms that an index threshold has been met, the insured receives an automatic pay-out.

**Nature of contract:** Business to consumer.

**Clyde Code parametric insurance**

In 2019, the law firm Clyde & Co launched a connected parametric insurance contract through its smart contract consultancy Clyde Code. The smart contract provides cover to a solar energy producer against the risk of shortfall in expected energy generation due to unfavourable weather conditions.\(^\text{22}\)

**Stage:** We understand that Clyde & Co is now offering its solution to the market.

**Technology:** The smart contract consists of a data model, a logic code, and a supporting natural language contract. We understand that it was built in collaboration with the smart legal contract platform Clause based on the specifications developed by the Accord Project, but that it can be deployed on other systems and platforms.

**Oracle:** We understand that the contract operates by receiving weather data from external sources, but it is unclear which sources are intended to be used.

**Automated contractual terms:** The contract automates the pay-out from the insurance policy by receiving weather data, calculating potential claims obligations, and producing an exportable report on insurance premiums or losses.

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\(^{19}\) GitHub, 'NorbanDev / RealEstate2.0' <https://github.com/NorbanDev/RealEstate2.0>.

\(^{20}\) Arbol, 'What is Arbol?' <https://www.arbolmarket.com/about>.


Nature of contract: Business to consumer.

2.7.5 Aircraft refuelling

Aviation fuel smart contract contracts (AFSC) system

In 2018, S7 Airlines, Alfa bank and Gazpromneft-Aero developed a blockchain-based smart contract to refuel an aircraft. The technology aimed to facilitate quicker settlement of accounts and minimise the financial risks by removing the need for prepayment or bank guarantees. We understand that when the pilot of the aircraft requested the agreed volume from the operator, the airline’s bank received an order and reserved funds on the airline’s account. Funds were debited from the airline’s account once the refuelling was completed, and accounting documents were exchanged between the parties.23

Stage: The technology was to be offered to customers by the end of 201924, but it is unclear whether this was carried out.

Technology: The smart contract was deployed on a private Ethereum protocol based blockchain.

Oracles: It is unclear from publicly available information whether the contract used an oracle.

Automated contractual terms: The contract automated payment terms and generated accounting documents in digital form.

Nature of contract: Business to business.

2.8 What benefits and cost savings can smart contracts provide compared with traditional contracts? Will increased use of smart contracts lead to any additional costs? Please provide details and any available qualitative and quantitative evidence [2.66].

2.8.1 Benefits and cost savings

The use of smart contracts may provide the following benefits:

(A) a reduction in the number of human errors;
(B) a reduction in the amount of labour required to manage a contract;
(C) an increase in operational speed;
(D) a reduced need for intermediaries;
(E) a reduction in certain types of disputes due to the deployed smart contract being the single source of truth setting out the parties’ obligations, and the reliability of smart contracts and their logical model of operation;
(F) increased standardisation across suites of contracts;
(G) protection from value leakage; and

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valuable structured data generation that provides broad opportunities for
data analytics and other internal business integrations.

Some, although not all, of these benefits could be obtained (at least to some
extent) in other ways, for example through contract management software or
through the development of unilateral automated processes which sit outside of
the contractual framework.

2.8.2 Additional costs

Whilst smart contracting is in its infancy, formation costs are likely to increase
over traditional contracting processes, given the need to:

(A) create coded obligations (including, where appropriate, detailing how a
smart contract interacts with a company's systems or oracles) in addition
to agreeing them in natural language;

(B) invest in the operation of a smart contract platform;

(C) deal with any technical failures, including of smart contracts and their
platforms;

(D) insure additional technological risks; and

(E) resolve new types of disputes, including by way of formal dispute
resolution processes.

We expect, however, that the benefits and cost savings outlined above over time
will outweigh the additional costs for many use cases. A properly developed
smart contract platform is also likely to assist in reducing many of the additional
costs set out above.
3. CHAPTER 3: FORMATION OF SMART CONTRACTS

3.1 In what ways can parties reach an agreement through their interactions on a distributed ledger? [3.13]

A properly developed smart contract platform will support parties in reaching legal agreements in the same way that they currently do, adhering to the legal environment. Such a platform will also provide for the easy interaction between code and natural language and, most likely, a distributed ledger. The only difference between current practice and agreement on a distributed ledger should be that digital legal execution events are recorded in a “stickier” way – i.e. DLT is used to record legal execution and to create an audit trail and a single source of truth for the contract.

As to how digital execution may be recorded to a distributed ledger, one method that we might expect to see for legal documents on a permissioned system is consensus of execution by a proof of authority protocol. This should not, however, be considered an architecture requirement.

The extent to which this question may be relevant to smart contracts (but not SLCs) has not been considered.

3.2 Are you aware of programming languages which are specifically designed to enable parties to reach agreement on a distributed ledger? If possible, please give examples of the circumstances in which they could be or have been used [3.14].

We have not come across any programming languages specifically designed to enable parties to reach an agreement on a distributed ledger. We are, however, aware of programming languages designed to enable parties to enter into and manage smart contracts which may be used in conjunction with a distributed ledger. The use of a formal language or languages in smart contracting can provide the requisite structure, completeness and absence of nuance that natural language cannot provide. However, specific programming languages for smart contracts should not be necessary when using a well-developed smart contract platform.

As languages used to implement smart contracts, we are familiar with the Linux Foundation's Accord project, which has developed the Cicero and Ergo programming languages targeted at legal use cases. These languages are built on a foundation of primitives and logic that can express a variety of legal concepts. In our experience, transactional, repetitive, and concrete legal processes can usually be expressed in the Ergo language.

As a language used to specify smart contracts in a way which can be understood by both lawyers and coders, we are aware of the University of Ottawa's Symboleo specification language, which has been of significant assistance in the development of smart contracts. The concepts and primitives in Symboleo's specification language largely mimic those available in Accord Project's Cicero and Ergo implementation languages.

All three languages above, Cicero, Ergo and Symboleo, are formally verified programming languages, which means their behaviour can always be mathematically deduced.

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3.3 Do you consider that offer and acceptance can occur through the operation of autonomous computer programs deployed by the parties on a distributed ledger? If so: (1) in what circumstances? (2) on what legal basis? [3.20]

We consider that offer and acceptance can occur through the operation of autonomous computer programs deployed by the parties on a distributed ledger, particularly where supported by the inclusion of natural language. However, the decentralised operation of ‘autonomous computer programs’ can impact the way in which an offer is communicated and accepted.

3.3.1 Circumstances in which offer and acceptance can occur

(A) Where there is pre-programmed logic and an automated decision

We consider that an autonomous computer program deployed by a coder on a distributed ledger can offer to enter into a contract for a pre-determined benefit (for example, the exchange of a digital token, or downloading software), subject to certain terms such as price and timing. This offer can be accepted by another autonomous computer program that assesses the terms of the offer against pre-determined criteria. If the offer matches the criteria, then the second program will accept the offer by providing the information or performing the steps required by the offeror.

In circumstances involving the implementation of pre-programmed logic, where the software has no discretion on whether or not to execute the (offer or acceptance) function, there appears to be no reason why valid offer and acceptance should not be able to occur, save for any vitiating factors such as illegality.

Although smart contracts may be controlled by autonomous computer programs, it is not envisioned that the logic underpinning the smart contract will operate autonomously such that any actions taken by the smart contract will not be those expressly specified by the parties to the contract. Parties are free, however, to place autonomous computer program actors between themselves and the smart contract. For example, an autonomous actor could be provided with the requisite permissions to interact with the smart contract (i.e. sending requests and receiving responses) on behalf of a party. Such a situation mimics the deployment of high-frequency stock trading algorithms, although this deployment may not itself be part of a smart contract.

We recognise that where a smart contract is to be recorded on a distributed ledger, there may be a delay between the act of a party accepting the offer and the agreement being recorded on a distributed ledger. However, as acceptance need only be communicated to the offeror (or the computer program acting on behalf of the offeror), we do not consider that this delay is likely to affect the timing of acceptance, as either:

(1) acceptance will be communicated before the transaction is queued to be recorded on the distributed ledger; or

(2) acceptance will only be communicated at the point in time when the transaction is recorded on the distributed ledger.

We do not expect that the exception to the usual rule of communicating acceptance, the postal rule, would or should be extended to cover this time delay.
(B) **Where more sophisticated 'AI' is involved**

We believe that a computer program that itself decides (in a non-predetermined manner) the terms of an offer (or whether to accept an offer) without human intervention raises different considerations to the program based on pre-programmed logic. However, we consider that the contractual offer and acceptance process will be the same. An 'independent' program will establish the terms of its own offer (or whether to accept) within the bounds of the instructions provided to it, which may include the manner in which it can be accepted (although it seems more likely that the manner will be constrained by the format of the offer and the platform used), and acceptance will occur on the principles outlined in paragraph (A) above.

In the context of dealings between businesses, organisations making use of AI in this manner will need to consider updating their delegation policies to ensure that they cover 'autonomous computer representatives'.

### 3.3.2 Legal basis

The legal basis for offer and acceptance using autonomous computers is set out in *Thornton and Software Solutions*. The owner of a machine or the programmer of a computer may hold out a computer as being authorised to conclude contracts on their behalf. We suggest that this analysis applies equally to pre-programmed computers executing defined rules, and also to autonomous computers capable of defining their own terms of an offer or analysing and accepting offers within particular sets of instructions.

We believe that a contract should be viewed objectively. The following questions may be asked:

(A) Has there been an offer?

(B) Has the offer been accepted?

(C) Can the terms of the contract be objectively determined?

The reasons behind an offer (including the logic adopted by an 'AI' program) do not factor into the assessment of the contracting process. If the terms of the offer and any related acceptance are clear and unequivocal, they will meet the requirements for contract formation.

We also note that no particular form is required to constitute an offer and acceptance under English law, provided that the offer and acceptance are unequivocal. The programs are simply the instrument/method used to communicate offer and acceptance. Since the logic was deliberately designed by human actors representing the parties, the agreement would be attributable to them. For example, in the case of smart contracts, acceptance may be indicated via the relevant party 'signing' the transaction with their private cryptographic key or by the transfer of cryptocurrency.

We consider that there may be a risk for the entity deploying the 'AI' program that it will not understand why contracts have been entered into. However, this is a risk taken at the time the 'AI' program was deployed and enabled to enter into contracts. We believe that if that entity holds out the 'AI' program as being

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27 *Thornton v Shoe Lane Parking Ltd* [1971] 2 QB 163; *R (Software Solutions Partners Ltd) v HM Customs & Excise* [2007] EWHC 971 (Admin).
authorised to enter into the contract, then that party should be bound by such an agreement.

We recognise that the opaque calculations of artificially intelligent programs, including 'black box' machine learning are sometimes seen as barriers to automated contracting. While such programs raise ethical, and potentially legal, challenges to decision making and its impact on people, we do not believe that this presents issues in relation to contract formation.

3.4 How common is it for parties to enter into smart contracts on a DLT system without knowing each other’s real identities and in what circumstances is this likely to arise? [3.25]

We do not consider that pseudonymity is a bar to contractual relations where a person is ascertainable, particularly where dealings in identifiable property are concerned. However, we consider pseudonymity to be a significant challenge to the enforcement of a smart contract, since it will likely, in most circumstances, be practically very difficult to seek redress against a counterparty acting through a pseudonym on a DLT system if there is a dispute arising in relation to the contract. This difficulty highlights the need for lawyer-led design of digital infrastructure that facilitates autonomous contracting or smart contracting, that builds mechanisms for verification of party identity into smart contract platforms. The challenges posed by pseudonymity add weight to the argument that permissioned DLT systems are currently a favoured approach. DIIP 2021, as described in paragraph 2.2 above provides useful guidance on best practice permissioning and identification requirements for a platform designed to support smart legal contracts.

We consider that, in some cases, parties may have the risk appetite to enter into transactions pseudonymously. However, many cases of commercial contracting will require enforceability and certainty not available where the identity of the parties is unknown.

We are not aware of how common it is for parties to enter into smart contracts on a DLT system without exchanging real identities but by analogy to non-smart contracts, some types of contract, such as contracts for car parking or for goods at vending machines, or contracts for goods purchased in person with cash, may not require parties (or one of the parties) to be identified.

3.5 What evidence might be available to a court to establish the identity of the parties to a smart contract entered into pseudonymously on a DLT system? [3.26]

In existing public DLT systems, such as the Bitcoin and Ethereum blockchains, parties act through automatically generated pseudonyms, also known as wallet addresses. It may be possible to combine wallet addresses with other public information such as previous transaction data and IP addresses to produce evidence of a party's identity. However, such evidence may not be conclusive. As additional evidence, it may be possible for a court to order an intermediary, such as a smart contract platform operator, cryptocurrency exchange or wallet provider to disclose evidence relevant to identity, which could include transaction data and any other data which might link a transaction to a particular party. Additionally, most jurisdictions now have significant AML/KYC/identity verification requirements to which cryptocurrency exchanges must adhere.

More evidence of parties’ identities may be available for private DLT systems, where, in addition to IP addresses, operators may also control the issuance of wallet addresses to maintain accurate records of party identity, allowing parties to operate under pseudonyms with other parties, but where such records may be accessible privately through a court order.
Conversely, some parties on either public or private DLT systems may publicise their identity and/or employ an identity verification service to allow other parties to confirm their identity.

3.6 Are you aware of, or do you foresee, any difficulties in applying the law on consideration to smart contracts? If possible, please provide examples [3.30].

A properly developed smart contract platform will support the formation of smart contracts because it will allow for the easy interaction of code and natural language and not interfere with the legal environment, including the provision of consideration. Such a platform may assist with the provision of consideration, for example by either facilitating actual transfers of funds, or the interaction of a contract with third party payment infrastructure (most likely in the short to medium term), thereby creating an audit trail of monetary or valuable consideration attached to the contract itself.

Parties entering into a simple smart contract are also able to undertake mutual promises (for example, undertaking to pay bitcoin for a token), which evidences the provision of consideration under the smart contract.

Without a properly developed smart contract platform, difficulties can arise if a coded obligation in a smart contract does not identify requisite consideration. It might not be possible to identify requisite consideration using extrinsic evidence or there may be a total failure of consideration. Although a court may accept evidence of the existence of consideration beyond the terms (including the coded terms) of a contract, there is a risk that by not specifying or making it clear in well-written code that a court will be unable to find consideration. For example, a smart contract may state that a party will pay the other a sum of currency, but that may form part of a wider arrangement (which includes the other providing goods or some other consideration) which is not documented, and whose provision of goods the first party may then find difficult to enforce. If there truly is no consideration, there will of course be no binding contract for the court to find.

3.7 Are you aware of, or do you foresee, any difficulties in determining whether the parties to a smart contract have reached a certain and complete agreement? If possible, please provide examples [3.35].

A properly developed smart contract platform will support parties in establishing a certain and complete agreement.

Under English contract law, if an agreement is uncertain in a sufficiently material respect, it cannot constitute a binding contract. This may occur if the agreement is vague, ambiguous, incomplete or constitutes a mere ‘agreement to agree’.

We consider that the question of certainty is nebulous in relation to smart contracts consisting solely of code, or smart contracts created or running on a platform not properly designed to deal with the complexity associated with the introduction of code into the contract. It may be almost impossible to read the object code running a smart contract, however, the parties may still have reached a certain and complete agreement.

Practical issues may arise where a party is not able to understand programming languages. However, we consider that at common law, it would be difficult for a party to avoid performance of a smart contract on the basis of a lack of agreement or mistake arising from failure to understand the relevant programming languages. This may be an obstacle to enforceability in the case of consumer contracts.

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28 For example, see Barclays Bank Plc v Schwartz [1995] C.L.Y. 2492.
We believe that smart contracts established by AI programs could meet the requirement for certainty if the terms are explained in a way that is understandable to human participants (including specialists). This may necessitate additional steps for the AI program. However, if these steps are omitted and the smart contract output is produced only as object code, it may suffer from the same lack of certainty referred to above.

We understand that there is a prevailing view that if a smart contract executes properly then it must be sufficiently certain. However, without an understanding of the smart contract, the parties will be unable to ascertain whether it has executed properly. Illustratively, the smart contract may perform some routines but not others, and some elements envisaged by the parties may be left un-performed. Parties unable to understand the contract may then have the impression that the contract has executed as intended, when it is not in fact so.

Uncertainty may also arise from lack of clarity about where the 'boundaries' of the contract lie. The code contained in a smart contract must go through multiple layers of technology (for example, the compiled code must be converted to object code, then to machine code) before it produces a final result. We consider that there is potential for unexpected outcomes due to errors in one of those layers, or an incomplete understanding of how they operate.

We believe that a potential lack of certainty is a key factor in favour of joining natural language with obligations that are also expressed in code. However, this is not a failsafe, as there may be cases where a court finds that the code should be taken into account (or take precedence), and the code may not operate as intended or may fail to execute in certain situations.

3.8 Are you aware of any instances where the parties to a smart contract have expressly agreed that they do not intend to create legal relations? [3.46]

We are not aware of any such instances. However, with reference to our considered distinction between smart contracts and SLCs explained at paragraph 1.5 above, we believe that there is a strong argument to be made that in many cases, parties do not intend to create legal relations when entering into certain types of "smart contracts", they are instead trying to automate a particular process using distributed ledger technology.

3.9 Do you foresee any difficulties in ascertaining whether parties intend to create legal relations when they transact with one another on a distributed ledger? [3.51]

If parties use a properly developed smart contract platform that supports a user friendly ability to draft in natural language and code, we do not foresee any difficulties in ascertaining whether parties intend to create legal relations when they transact with one another on a distributed ledger.

3.10 Do you consider that source code could meet the definition of "writing" in the Interpretation Act 1978? [3.62]

We consider that as long as source code can be printed or read on a screen, it could be considered to meet the definition of "writing" in Schedule 1 of the Interpretation Act 1978 as including typing, printing, lithography, photography and other modes of representing or reproducing words in a visible form. However, this question is largely irrelevant when using a properly developed smart contract platform that supports a user friendly ability to draft in natural language and the ability to add automations without a need for the contracting parties to refer to or understand the code.
Our conclusion that source code could meet the definition of "writing" follows from the premise that source code is code created or instructed to be created by a coder either using an integrated development environment or another tool, which will, in the absence of errors, be understandable by either that coder or another person with an appropriate understanding of the language in which that source code is written.

Ensuring that source code can be printed or read on a screen ought to be an additional step taken by a coder when deploying the smart contract onto a smart contract platform, because it is not usually possible to translate object code back into its original source code. Consequently, if the coder attaches an out-of-date source code version, we believe there is a possibility that the source code does not truthfully reflect the object code. A boilerplate provision could address which of any out-of-date source code and object code is intended to take precedence.

We do not consider that a person unfamiliar with the language of the source code would need to be able to understand the code for it to satisfy the definition of "writing". However, if the source code is encrypted to be stored on a smart contract platform, it will need to be decrypted before it can be reproduced as words capable of meeting the definition of "writing". This applies equally to traditional non-smart contracts whose sole storage medium is encrypted.

Whilst we are not aware of any case law on whether a computer code could constitute a validly written contract, several court decisions have held that electronic communications such as emails satisfy the particular statutory requirements to be considered to be in "writing".

3.11 Do you consider that parties can "sign" an agreement recorded solely in code? If so:

3.11.1 are you aware of technologies that are currently in use or under development to facilitate the signing of agreements recorded solely in code?

3.11.2 please provide any examples from your experience of where the parties have signed an agreement recorded solely in code [3.66]

We consider that contracting parties may sign a smart contract recorded in code, and could do so through the use of an external electronic signature service and an appropriate smart contract platform which would link the code with the electronic signature. We understand that Clause.io29 (a smart contract platform) and DocuSign30 (an electronic signature service) have partnered31 to enable this possibility, but we have not evaluated the technology.

In most cases, there is no uncertainty as to the validity of electronic signatures in the UK, and this applies equally to electronic signatures affixed on smart contracts. The Law Commission's report on the execution of electronic documents32 and the Lord Chancellor's following endorsement confirmed that electronic signatures are permissible under current law.33 Additionally, the eIDAS regulation, replicated into UK law following the UK's

29 Clause <https://clause.io/>.
30 DocuSign <https://www.docusign.co.uk/>.
withdrawal from the European Union, confirmed that 'qualified electronic signatures' are automatically considered equivalent to handwritten signatures.

We maintain our position on the risks and legal status of an "agreement" written entirely in code as a separate consideration to whether it is possible to "sign" a document written entirely in code.

3.12 Do you think that smart contracts using DLT are currently able to utilise eIDAS compliant advanced electronic signatures and qualified electronic signatures? If not, how do you think they could be designed to accommodate these types of signatures? [3.73]

We consider that smart contracts using DLT are currently able to utilise eIDAS compliant advanced electronic signatures and qualified electronic signatures. We understand DocuSign to be an eIDAS compliant electronic signature provider.³⁴ Smart contracts can be designed to incorporate and execute upon receiving a signing event emitted by DocuSign. For example, Clause.io has incorporated DocuSign into the Accord Project smart contracts capable of running on its smart contract platform.

3.13 Are you aware of any cases in which parties have arranged for the terms of a deed to be performed by, or recorded in, computer code deployed on a distributed ledger? [3.79]

We are not aware of any such case. However, we believe that there is no reason for obligations in deeds to be treated any differently from ordinary contractual obligations, although we recognise that there may be challenges relating to entering into a deed digitally in terms of formal requirements, as discussed at paragraph 3.14 below.

3.14 Do you consider that a deed recorded partly or wholly in code can satisfy the statutory formality requirements applicable to deeds and address the implications of the Mercury decision? [3.80]

Our view is that it is possible, subject to the caveats below, for a deed to be recorded in a combination of source code and data (and it may be possible for a deed to be recorded solely in code), and for such a deed to satisfy the implications of the Mercury decision.

As outlined in the Call for Evidence, there are four formal requirements when considering whether an instrument is a deed.

3.14.1 A deed must be in writing

We consider that our answer to whether source code could meet the definition of "writing" in the Interpretation Act 1978 in paragraph 3.10 above is equally applicable to this requirement for deeds, appreciating that this requirement is a common law, rather than a statutory, requirement.

3.14.2 A deed must make it clear on the face that the party or parties intend it to be a deed

This requirement is usually satisfied by standard wording within the deed (such as, "signed as a deed by … "). Where a part of the deed is recorded in natural language and other parts are in code, the parts needed to meet this requirement

³⁴ DocuSign, ‘Standards Based Signatures’ [https://www.docusign.co.uk/how-it-works/electronic-signature/digital-signature].
may have to be in natural language. If the whole document is in code, it may be not be clear that the parties intend the code to be a deed. By analogy, where a document is executed under seal without any mention of the word "deed", this will not satisfy the "face-value" requirement of deeds in section 1(2A) Law of Property Miscellaneous Provisions Act 1989. Natural language included as a "comment" in the code (i.e. text that is inserted within the code in a way that can be read by humans, but which would be ignored when the code is compiled) may satisfy this requirement, but it may be a more certain approach to include appropriate wording in the natural language portion of an SLC to satisfy this requirement.

3.14.3 **A deed must be validly executed as a deed**

An electronic signature is capable in law of being used to validly execute a document (including a deed). The formalities still need to be complied with and the main barrier is that signatures often have to be witnessed, which requires the physical presence of the witness. Currently, when using DocuSign for real estate transactions, we note the inclusion of the following statement next to the execution block where the witness signs – "I confirm that I was physically present when [name of signatory] signed this deed." This is recommended, but not mandated, practice by HM Land Registry (section 13.2 of HM Land Registry Practice Guide 8) and there is clear evidential value of such a statement being included in an electronically executed deed (whether or not to be filed with HM Land Registry). We understand that the Law Commission recommended that the formalities for deeds may not be fit for purpose in the 21st century and a possible review of deeds also forms part of its consultation on the 14th programme of law reform. We consider that the execution of a smart contract could take place offline, with the results of that execution transmitted back to the smart contract, in much the same way as a virtual signing. It is also likely that in time, machines will provide an acceptable substitute function and process to witnessing (and possibly to a higher standard of fidelity than the traditional physical witnessing).

3.14.4 **A deed must be delivered as a deed**

Delivery no longer requires a physical act but takes place on the occurrence of acts sufficient to show an intention to be bound by the deed (which often involves physical delivery but doesn't have to). These acts could be recorded on a smart contract platform.

We consider that it is possible for a deed recorded wholly or partly in code to address the implications of the *Mercury* decision, noting that one of the implications is that the document to be signed must exist as a discrete physical entity at the moment of signing in order to be effective. It seems clear that this does not mean that the document needs to exist in paper form, and it can exist purely in electronic form.

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36 Law Com No 386, 104.

4. CHAPTER 4: INTERPRETATION OF SMART CONTRACTS

4.1 Are you aware of, or do you foresee, any difficulties in applying the principles of interpretation to identify whether terms of a particular smart contract are contained in the natural language component or the coded component of the smart contract, or both? [4.10]

If parties intend that code should be incorporated into a contract, we recommend that SLCs are used, where coded instructions are joined with natural language and there is an expression, for each conjoined term, to nominate which of the natural language and the coded instruction is the primary expression of the parties' enforceable legal obligations. We consider that this method is likely to reduce (though may not entirely remove) the difficulties in applying the principles of interpretation to identify whether terms of a particular smart contract are contained in the natural language component or the coded component of the contract.

The conjoined method will work best if there is not a great deal of disparity between the intention of the coded instruction and the intention of the natural language that has been coupled together.

If the parties to an SLC elect for natural language in a conjoined term to take precedence, or the parties' contract is written solely in natural language within the definition provided in the Call for Evidence, this should have significant persuasive value, should there be any disagreement in establishing that all of the parties' obligations are defined in natural language (such that any coded expression does not amount to a condition of the contract capable of breach). Such a scenario should allow a term to be interpreted based on its natural language only, and if automated performance does not comply with the natural language term, a party is likely to have a remedy in accordance with the natural language term.

In the absence of the SLC methodology, we expect difficulties could arise in identifying whether terms are contained in the natural language component or the coded component of a smart contract, or both, where:

4.1.1 the parties express a term in both natural language and code without an indication of which version should take precedence;

4.1.2 the parties express a term in both natural language and code, where the natural language and the code do not identifiably map to each other, such as where it is not possible to locate either the natural language or the coded expression, or the 'versions' of each expression do not match, possibly because the parties have not elected to use a smart contract platform which stores the natural language and coded instructions together; or

4.1.3 the parties express a term in both natural language and code and indicate which version should be the primary expression, but, following the usual rules of contractual interpretation, a court considers that the parties' indication should be disregarded when interpreting the contract as a whole, likely following the argument of a party disadvantaged by an indication of precedence.

Additionally, we note that it is good practice to include natural language comments in source code. Where such comments form part of any source code incorporated into a contract, we recommend that parties address how comments are to be taken when interpreting the contract (or a particular term). We expect that, in most cases, it would be more appropriate for parties to opt for the comments to be ignored if a coded term is expressed to have legal effect, particularly where the contract includes conjoined terms (as we would recommend).
4.2 In what circumstances might disputes arise about the proper interpretation of the coded terms of a smart contract? Please provide examples where possible [4.15].

In addition to the examples set out by the Law Commission in paragraph 4.13 of the Call for Evidence, it is our view that disputes might also arise about the proper interpretation of the coded terms of a smart contract where:

4.2.1 one party claims that an implied term conflicts with a coded term, or that a coded term is in fact not a term of the contract, but merely a method of performing an implied term, and a party asks a court to interpret both ‘terms’ to resolve the dispute;

4.2.2 the parties have (in some form) varied their performance of the contract without formal amendment (which may give rise to arguments that a party has waived its rights or that some form of estoppel arises);

4.2.3 it is unclear whether or not the legal manifestation of a term is to be found in code. A court may then consider it necessary to interpret the code to understand its effect;

4.2.4 the code has been changed by a party or third party acting in bad faith. A court may then consider it necessary to interpret the term to understand the changes made by the third party, the risk of which may be reduced through the deployment of a smart contract using an immutable ledger;

4.2.5 the code performs an unlawful act or an act that breaches either another term in the smart contract or an obligation owed by a party either to the other party or a third party, which could cause a court to consider it necessary to interpret the coded term to understand the dispute or the unlawful act;

4.2.6 there is a dispute between a person carrying out coding services or providing smart contract platform services and the person engaging these services; or

4.2.7 natural language does not premeditate how the contract should deal with code, privacy, portability or certainty.

4.3 Do you consider that the meaning of a coded term of a smart contract would or should be determined by asking what the term would mean to a:

(1) reasonable person;

(2) reasonable person with knowledge of the relevant code; or

(3) functioning computer? [4.30]

We do not think that any of the above options are correct. Instead, we consider that the meaning of a coded term of a smart contract would and should be determined by applying the current test of contractual interpretation, being what a reasonable person would have understood the (coded) term to mean, having all the background knowledge which would have been available to the parties.

We consider that background knowledge would not necessarily mean the reasonable person having actual ‘knowledge of the relevant code’, but that the reasonable person must have the meaning of the code sufficiently conveyed to them and have the necessary knowledge and expertise to be able to enter into a contract that includes coded terms. By analogy, if the term was written in a foreign language, the meaning of the term is likely to be conveyed by way of expert translation. For a conjoined term, the conjoined natural language may provide the requisite meaning as evidenced by the parties’ agreement on the natural language expression’s priority over the code.
We do not consider that "asking what the term would mean to a functioning computer" would provide a satisfactory outcome for the following reasons:

4.3.1 AI computing is not yet at a stage where a computer can derive or explain the meaning of a process. "...meaning to a functioning computer" can only be assessed by a human explaining in natural language what a coded term appears to mean to the extent such a deduction is possible;

4.3.2 it is only possible, as the Law Commission suggests, to observe the outcome of a coded term to a computer, and this may not constitute "meaning", especially if it is not possible to replicate the precise inputs for the coded term in retrospect; and

4.3.3 determining "meaning to a functioning computer" would bear no resemblance to the existing rules of contractual interpretation, as although a court will not intervene to correct clear wording, even if that wording is uncommercial, the court may intervene where the coded term does not reflect the parties' intentions. Such intervention would be largely prohibited by this test unless the performance of the code could be readily predicted (which we suggest is not always possible in paragraph 4.4 below) and the parties' intention can be adequately deduced.

4.4 Do you consider that performance of the coded terms of a smart contract cannot always be predicted based on a reading of the code? If so, can you provide examples or specific evidence of this occurring? [4.31]

If parties use a properly developed smart contract platform that supports a user friendly ability to draft in natural language with automation through predictable code that is coherent with the parties' intention expressed in natural language, predicting performance based on reading code is less likely to be an issue in terms of risk of breach of contract. We consider that it will remain an issue for efficient performance.

However, if parties use smart contract platforms that do not require such steps (with the consequence that the code adopted may be less predictable), we consider that the performance of the coded terms cannot always be predicted based on a reading of the code (within practical bounds of time and cost for the human reader(s)). We expect that it will usually be possible to understand how a coded term is expected to operate by reading its source code and stepping through the code as a compiler and interpreter would do, subject to the following caveats:

4.4.1 Most coded terms will require some form of input and produce some form of output. Often, only by knowing the expected input is it possible to predict the output of the code, which would include an ability to predict that an error would occur. Without knowledge of the input, it will usually be beyond human means to predict the output as there will be an unknown number of possible outputs. For example, in the code provided on pages 56-57 of the Call for Evidence (the "Code Example"), without knowing the input value for the variable property "contract.discountFactor", which is not apparent from that code provided, it may not be possible to predict the "totaldiscount" to be applied to the "totalPrice" and outputted in the emitted "PaymentObligation" and returned "PriceCalculation".

4.4.2 If a coded term is poorly written, it should be possible to predict the output of the code for a given input, but it may be particularly burdensome and time-consuming to carry out the prediction process or to explain the purpose of the code. In an extreme case, complex and poorly written code could be beyond reasonable human means to understand without additional information. This burden could be reduced if the code is well-written, commented upon (as is common practice within source code) and the reader of the code is provided with the context for the
code, in terms of both natural language and the environment in which the code will run. In the Code Example, comments are indicated by lines starting with "/\*".

4.4.3 If a coded term relies on additional code dependencies, it will not usually be possible to predict the performance of the coded term without either reference to the source code of the dependencies or an ability to run the dependent code. For example, in the Code Example, even with all relevant input values, it is not possible to predict the value of "discount" and therefore the resulting "PaymentObligation" and "PriceCalculation" without an understanding of the "calculateTempdiscount" and "calculateHumdiscount" functions, on which the coded term is dependent. These functions cannot be understood to the extent required to predict performance from the Code Example alone.

4.4.4 If a coded term invokes the use of a machine learning model (commonly referred to as AI), subject to the caveats above, it will be possible to predict the output of the code for a given input, but it may not be beyond human means to explain in natural language why that output was reached. If the machine learning model automatically changes (re-trains itself) over time, performance will only be predictable if the state of the model at the relevant time is known.

It is sometimes possible to decompile object code to predict its performance, but it is assumed for the purposes of our response that the source code will be available for interpretation.

4.5 What practical or procedural steps could the courts take to resolve disputes about the interpretation of the coded terms of a smart contract? [4.32]

The courts may apply ordinary principles of interpretation to source code (including to any comments within the source code, as relevant) that forms part of a smart contract. Where source code lacks a natural language counterpart, or the source code or natural language is poorly drafted, the court should use the interpretative tools it currently possesses to determine an interpretation for the source code. The courts may employ the assistance of a person familiar with the operation code, an expert or assessor to determine how particular code operates, which may help with formulating a view on the intention behind a clause. If the court determines that the parties' intention is not reflected in a clause, it should seek to give effect to the parties' intention. This may occur through rectification of the natural language or source code component, or both. We expect that it will be possible, at least on sophisticated smart contract platforms, for rectification to occur in relation to smart contracts, as explained in paragraph 5.1.

4.6 Are parties utilising natural language in smart contracts to make their intentions clear in respect of any coded terms or the contract as a whole? [4.37]

Whilst we cannot speak to what is occurring operationally for contracts we are not involved in, it is our position that for commercial contracting, parties should always seek to use natural language to present the contract as a whole, with coded terms sitting underneath some appropriate natural language terms or processes that are suitable for automation. As explained in paragraph 1.5.4 above, we encourage the use of a properly developed smart contract platform that supports this approach.
4.7 In what (if any) circumstances should courts be able to consider evidence of the
parties’ pre-contractual negotiations as an aid to interpretation of the coded terms of
a smart contract? [4.43]

It follows from our response at paragraph 4.4 above (that the performance of the coded
terms of a smart contract cannot always be predicted based on a reading of the code) that
there are likely to be circumstances in which pre-contractual negotiations might assist a
court in interpreting a coded term of a smart contract.

We are of the view that for the reasons outlined in paragraphs 4.41 and 4.42 of the Call for
Evidence, and especially as a party's position may change during negotiations and third
parties must be able to rely on contracts with certainty, the usual exclusionary rule should
be preserved for coded terms of smart contracts. As we expect that parties may come to
re-use coded terms in negotiations for other contracts, we expect that objective certainty
will be of increased relevance for smart contracts.

This view promotes certainty and diligence in drafting and instructing coders in translating
natural language into coded terms, and does not prohibit parties from including useful aids
to interpretation within the contract, which could include process flows, diagrams, and
potentially comments within the source code. However, parties and their advisers should
seek to ensure that the order of precedence and purpose of such additional material is
made clear, otherwise its inclusion may simply give rise to other disputes or disputes in
other circumstances.

Where the apparent intention of a coded term is different from that of a party or parties,
multiple alternatives to changing the exclusionary rule may be available.

Where the apparent intention of a coded term is different from both parties' common
intention, rectification may be possible following our response in paragraph 5.1 below.
Where a party has suffered loss as a result of the coded term not reflecting its instructions
to a coder, it may be open to that party to pursue the coder in contract and/or in tort,
though we expect that such recovery may be limited by the arrangements between the
coder and the party, and practical considerations such as the coder's ability to pay.

4.8 Do you consider that the courts’ current approach to contractual interpretation
might cause problems in the context of smart contracts? If so: (1) Can you provide
examples or specific evidence of this occurring? (2) What could be done to solve
these problems? [4.45]

Save for the areas discussed above, it is our position that the current rules of contractual
interpretation are adequate.
CHAPTER 5: REMEDIES AND SMART CONTRACTS

5.1 Are you aware of, or do you foresee, any practical difficulties in ordering rectification of the coded terms of a smart contract? If so, do you think that parties to a smart contract will, in practice, seek rectification? [5.26]

We do not foresee such difficulties if the parties use a properly developed smart contract platform that has a user friendly ability to draft in natural language. The parties may then set out how the contract may be rectified, including any acts of reversal required between themselves, in the contract itself. Such a platform could also support any pre-agreed automated acts of reversal, ensure the parties are known to each other to allow normal remedies to apply, and assist with data privacy regulatory compliance and erasure capabilities.

Given the complexities of rectifying or otherwise dealing with coded terms of a contract, and as a matter of best practice, we expect that well-advised parties will make express provision (in natural language) to address the consequences of malfunctioning code, and to allocate risk between them for unintended effects. At least initially, parties may prefer to set these provisions out in natural language accompanying the coded terms.

Such provisions may include:

5.1.1 representations and warranties that a coded term will operate in a certain way, with recourse against the party giving such representations and warranties in the event of malfunctioning code;

5.1.2 provisions for the parties to agree amendments to the code, or to submit disputed amendments for adjudication (including by way of expert determination, which may be safer and more efficient than referring such disputes to a non-specialist court or arbitral tribunal);

5.1.3 'pause' or 'kill' commands, which enable the parties to suspend or terminate the execution of malfunctioning code pending rectification (such commands could be contained in the coded portions of the contract, and be triggered by specified commands or conditions to be agreed between the parties);

5.1.4 provisions to reverse or unwind commands or transactions executed erroneously (although the ability to code these into the distributed ledger would depend on the architecture used); or

5.1.5 obligations on parties to return assets transferred pursuant to an error in the code, or provide appropriate compensation.

The inclusion of such provisions in an SLC is likely to diminish the practical significance of rectification as a remedy. Even where such provisions are not included, paragraphs 5.1.1 to 5.1.5 above are useful points to consider when analysing whether and how code should be rectified by reference to what the parties intended for the agreement.

The value of including such provisions, together with other 'boilerplate' provisions to regulate the performance of coded portions of the contract underlines the importance of joining coded terms with natural language counterparts (as set out in our recommended SLC features in paragraph 1.5 above). Contracts written purely in code present multiple risks and difficulties in the application of principles of formation and interpretation (as explained in our responses to Chapters 3 and 4), and will pose similar difficulties for remedies. They are, in our view, not fit for purpose to govern complex and high-value commercial relationships.

We do, however, agree that the immutability of coded terms deployed on a permissionless (public, single ledger) distributed ledger architecture poses difficulties for rectification. In these conditions, the rectified terms of the code may need to be deployed as a new or amended contract, depending on the capabilities of the smart contract platform on which
the smart contract is deployed. For example, an append-only system would not allow for reversal of an automated action such as a notice or payment, but would allow for the functional effect of rectifying the action by sending the payment back again, or sending a notice that updates the prior notice.

In addition, where the rectification is sought after the erroneous code has executed, we expect that claims for rectification would be accompanied by claims for other remedies such as damages for breach, restitution, or unjust enrichment, to make good any loss to the claiming party. In these cases, declaratory relief on its own is not likely to be an effective remedy, and remedies will need to be sought to reverse or compensate for unintended transactions. However, owing to the additional impacts arising from the need to rectify code, we do think parties will in the future seek rectification.

5.2 Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether the parties have made a common mistake when entering into a smart contract? [5.41]

We do not foresee any significant difficulties in applying the law of common mistake to SLCs. Where the parties hold beliefs or assumptions about the performance of the coded terms of the contract which prove to be mistaken, we expect that (as above) well-advised parties will allocate the risks of such mistakes by appropriate drafting. If however, a party were to seek to contract using a smart contract using only code then, as with the concerns raised in response to the questions at paragraphs 4.1 to 4.4 above in relation to the interpretation of contracts, then the difficulty in arguing a case on the basis of common mistake (which is already legally and factually complex) will be heightened.

Where parties do claim for common mistake, the process of establishing the three requirements set out in The Great Peace is not likely to differ materially from traditional contracts, albeit that the court is likely to require expert assistance in understanding the coded terms that were actually concluded. Applying the criteria set out in The Great Peace:

5.2.1 The court will need to be furnished with evidence of the existence of a shared belief or assumption as to the existence of a state of affairs. As with traditional contracts, this is likely to include evidence of the parties' negotiations, heads of terms, or indeed the terms of an accompanying natural language contract.

5.2.2 The claiming party will need to establish that that state of affairs did not exist. In practice, this may require the court to have regard to the terms of the code or to the effects of code which has already executed (likely with the assistance of an expert).

5.2.3 The court will also need to be satisfied that the mistake renders performance of the contract, or achievement of the purpose of the contract, impossible. As noted in 5.2.2 above, where the impugned code has already executed, this is likely to be difficult to establish.

5.3 What steps or precautions (if any) do parties typically take before entering into a smart contract to satisfy themselves that the code will execute as intended? [5.42]

We are not aware of steps actually taken by parties to verify the coded terms of their contracts. However, a number of options exist in principle:

5.3.1 The parties can ensure that the coded terms of the contract are covered by appropriate natural language counterparts which provide for (among other things): (i) precedence between the natural language, the coded terms and any additional materials (such as process flows, diagrams and source code
Sophisticated parties may wish to simulate the operation of the coded components of their contracts. For contracts containing simple logic, it is conceivable that the entire lifecycle of the coded components of the contract could be simulated. The difficulty of simulating contract code relates to limitations in the input set – i.e. a human reader’s understanding of the source code will be bound by the permutation of inputs that can be feasibly simulated, such that it may be difficult or impossible to simulate all of the conceivable instances of the contract code over its lifecycle (see paragraph 4.4 above).

Additional precautions and best-practices can be implemented in relation to the code, including using mathematically provable coding languages (as explained at paragraph 3.2 above) and investing appropriately in testing both the parties’ smart contract code and its performance on their chosen smart contract platform.

5.4 Do you consider that the legal principles concerning unilateral mistake might need to be adapted to accommodate smart contracts concluded by computer programs without human intervention? In particular: (1) is it appropriate to confine a unilateral mistake to a mistake about a term of the contract? (2) what test should the court apply in determining whether the non-mistaken party had knowledge of the mistaken party's mistake? [5.56]

The approach of the majority of the Singapore Court of Appeal in Quoine demonstrates that principles of unilateral mistake akin to those recognised in English law can be "meaningfully adapted" to apply to contracts concluded without human intervention.

It is interesting that the dispute in Quoine arose between the provider of the cryptocurrency trading platform and a trader. We observe that the issues in that case could have been addressed by appropriate drafting in the membership agreement to enable Quoine to reverse trades that were entered into as a result of a malfunction of platform code (as occurred in that case). This reinforces our view in paragraph 5.3 above that appropriate drafting (preferably in accompanying natural language) is an important first line of defence in addressing unintended consequences of the coded terms of a smart contract.

5.4.1 Confining unilateral mistake to a mistake about a term of the contract?

As to part (1) of this question: it is difficult to see why the scope of the doctrine of mistake should be expanded beyond a mistake as to a term of the contract. Such an expansion would open the door to claims for mistake in a much wider range of circumstances than is currently the case, which would introduce considerable uncertainty in the binding status of smart contracts, even in fact patterns such as Quoine. In circumstances where, for example, the parties are free to determine between themselves what the consequences of a failure of their trading platform should be, it is unclear why the law should be expanded to regulate the consequences of a mistake other than as to the terms of the parties' contract. Of course, this does though mean that for a party to avail itself of a remedy in relation to a mistake, it will need to base its case on the breach of a specific term. As such, where a contract is a hybrid of natural language and code, care will need to be taken as to make clear the intended effect of the coded elements (for example, as to whether it is intended they are to be terms of the contract and how (if at all) they interact with the natural language terms of the contract).

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38 Quoine Pte Ltd v B2C2 Ltd [2020] SGCA(I) 02.
If smart contracts were treated as a 'special case' in which an expanded doctrine of mistake were held to apply, disputes may arise where the parties disagree as to whether their contract is a smart contract. While in the majority of cases this will be obvious given the presence of coded terms – and, indeed, the parties may include provisions expressly categorising the contract as a smart contract (see below) – this further militates in favour of retaining a single, uniform approach to the scope of unilateral mistake.

5.4.2 The test for determining whether the non-mistaken party had knowledge of the mistaken party's mistake

As to (2), the approach of the majority in Quoine is a sensible one where deterministic algorithms are involved (that is, as the Singapore court put it, an algorithm that "produces the exact same output when provided with the same input"). The Singapore Court of Appeal reasoned that because a deterministic algorithm was bound by the parameters set by the programmer, it was the programmer's state of knowledge that was relevant and to be attributed to the parties. The relevant inquiry was whether, when programming the algorithm, the programmer was doing so with actual or constructive knowledge of the fact that the relevant offer would only ever be accepted by a party operating under a mistake and whether the programmer was acting to take advantage of such a mistake. The relevant time frame within which the knowledge of a programmer or the person running the algorithm should be assessed was from the point of programming up to the point that the relevant contract was formed (at [93], [98], [99] and [103] of Quoine). In practice, this may differ from the approach ordinarily taken in cases of mistake where the relevant intention under consideration is the decision maker (which is often shorthand for the commercial/legal representative who negotiated the agreement). In circumstances where a smart contract concluded by a computer is being considered, the approach outlined above appears to us to be a potentially workable one and it may be artificial to, for example, look exclusively to the intention of a commercial/legal lead who instructed a programmer as to how an algorithm should operate.

However, it is acknowledged that the above approach is not without difficulties when applied to a smart contract concluded by a computer. For example, this approach may be difficult to apply where an algorithm is designed to refine (or retrain) itself based on data, or where an algorithm has been written collaboratively, sequentially or by multiple coders or contributors, or has been developed in a more multi-disciplinary way with decision-makers more deeply involved on a technical level. It is not clear how the majority's approach to determining knowledge would apply to these scenarios. Would the court still look at the knowledge of the ultimate or 'combined' human programmer (bearing in mind that she may not have anticipated that the eventual program would operate as it did), or would the court have regard to the operation of the algorithm itself to attempt to discern knowledge and attribute that to the programmer? Both approaches introduce considerable evidential difficulties.

Lord Mance's approach in Quoine offers a pragmatic solution to these issues – by asking, in effect, whether a reasonable person in the seller's position (as was the case in Quoine), with knowledge of the circumstances surrounding the transactions, would have concluded that the transactions were the result of a fundamental computer error. This approach would, however, require expanding the scope of mistake to matters other than the terms of the contract (in this case, a fundamental mistake as to how the platform would operate).
5.5 Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether a smart contract has been entered into as a result of a misrepresentation? [5.62]

We agree that the principles of misrepresentation can apply in much the same way to SLCs as they do to traditional contracts. The court or tribunal may require the assistance of experts to identify the meaning and significance of any pre-contractual representations concerning the terms or effect of the coded parts of the contract, but the application of the substantive legal principles does not appear to raise novel issues.

5.6 Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning rescission to smart contracts which have been vitiated for misrepresentation, duress or undue influence? [5.79]

Further difficulties may arise – in addition to those identified in the Call for Evidence – where rescission is sought of a contract that was entered into pseudonymously. The anonymity of the counterparty may make it difficult (if not impossible) to trace assets transferred under the SLC for the purposes of unwinding the relevant transactions. While the distributed ledger will provide an immutable record of the instant transaction – which could in the first instance facilitate the unwinding of transactions following rescission as all of the relevant transactions and assets could be identified in the immutable record – it may prove difficult to trace subsequent transfers of those assets through other pseudonymous users of the platform.

One solution to this is to use smart contract platforms which do not permit the use of pseudonyms, where the identity of other participants is known (at least to a central administrator), such that the relevant transactions and assets can be identified and unwound.

5.7 Are you aware of, or do you foresee, any difficulties in awarding damages for breach of contract where the terms of a natural language contract are performed automatically by computer code? [5.91]

Subject to establishing breach and causation of loss, we do not expect novel difficulties to arise in awarding damages for breach of contract where the terms of a natural language contract are performed automatically by computer code. Quoine is a good illustration that traditional damages principles can be applied to SLCs (and cryptocurrencies in particular) without difficulty.

Malfunctions in the coded terms may give rise to questions about the existence of and liability for a breach of contract. Ideally, when code is incorporated into a natural language contract, the contracting parties would clearly and formally provide for whether the failure of code to run as expected gives rise to a breach of contract, or whether alternative manual means of performing the job the code was meant to perform will suffice as performance. Similar considerations apply to failures or anomalies in external data sources and oracles.

This can be done by the addition of 'smart boilerplate' terms in the natural language component of the contract, which provide overarching governance of the coded portions of the agreement. Alternatively, this can be done on a clause-specific basis, by having the natural language clause 'conjoined' with its corresponding coded expression, which governs the consequences of malfunctions in the corresponding code.39

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Once a breach is identified, causation difficulties may nevertheless arise, particularly where trigger events for the performance of a party’s obligations are automated. On the one hand, it may be said that the contracting parties agreed to the specification and use of given triggers, and should in the natural language of the contract have provided for any responsibilities or liabilities in respect of the code executing automatically.

Difficulties may arise where an algorithm is used to make a decision in relation to a contract, such as whether a condition has been fulfilled. It may be arguable that responsibility (and liability) for that decision should be attributed to a third party machine, such as the smart contract rather than the parties. However, given the current state of technology and law, we expect that the actions of an algorithm are likely to be attributable to a party.

Ideally, of course, the parties should clearly ascribe responsibility of both performing an obligation and responsibility for the manner in which code executes, to either one or both of the parties to avoid disputes over whether machine-assisted or machine-led processes impact the chain of causation and liability.

5.8 Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning termination where the terms of a natural language contract are performed automatically by computer code? [5.95]

Where responsibility for triggering a termination right rests with the parties themselves, traditional principles of termination ought to be applicable without much difficulty. Practically speaking, as recognised in the Call for Evidence, parties may wish to include a ‘kill’ command to stop the execution of the coded terms of the contract on termination. If disputes arise as to the validity of termination or repudiatory breach, these can be addressed by the application of traditional legal principles.

Difficulties may arise, however, where the triggering of a termination right is automated. The fact that coded terms are unable to take into account concepts such as reasonableness, common sense or empathy may result in unintended or unlawful termination. Moreover, there may be factors outside the smart contracts’ ‘understanding’ (for example, matters which result in a force majeure event being in existence or the contract being frustrated) which could result in that automated termination being invalid and, potentially, such purported termination itself amounting to a repudiatory breach of contract.

By way of example, if a party were to automate a right to reject delivery and terminate a contract if, say, a delivery of 100 widgets was short by one widget, it may be forced into termination in circumstances where it would otherwise choose not to exercise such a right. The termination of that contract could lead to a dispute (for example, if the supplier had received a written or oral request outside of the SLC platform to only provide 99 widgets) and may involve a complex assessment of any damages one or both parties is owed. Added to that, the rejection of that delivery may impact on further contracts (whether in a traditional form or SLCs) entered into by the customer, meaning that it cannot now deliver the same widgets to one of its customers. Moreover, it may not be in the customer’s interest to terminate in such circumstances if, for example, the contract price for the 99 widgets supplied was lower than the available market price.

Of course, such an outcome could be avoided by writing tolerances into the code (for example, if 99 widgets are delivered instead of the specified 100, the code could generate an automated notification to the relevant party and give the party the option to terminate or not). Nonetheless, what this example goes to show is that parties will need to be very careful in choosing what they should automate, be alive to the inadvertent consequences such automation may have, and ensure that there is alignment between any associated natural language provisions and any coded provisions which are intended to be triggered
automatically. The current human application of decisions in relation to rejection and termination should not be under-estimated.

5.9 Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning breach of contract to contracts recorded wholly or partly in computer code? [5.104]

As discussed in chapters 3 and 4 above, we consider that "contracts" concluded solely in code may present difficulties in formation and interpretation. Those issues in turn create difficulties in ascertaining the existence and consequences of a breach of terms recorded solely in code. We consider that SLCs comprising conjoined terms are likely (at least initially) to be the preferred form amongst commercial parties for automating the performance of specific obligations. We expect that it will be considerably more straightforward for parties to specify in the natural language portion of the contract whether malfunctioning code amounts to a breach of contract, and to provide for the consequences of that breach, than it will be to do so in the coded terms themselves.

That said, and to the extent permitted by the coding language and platform architecture chosen, ideally the coded terms of the contract would specify whether malfunctions in the code amount to a breach and, if so, which party bears responsibility for that breach.

As to the specific scenario posited in paragraph 5.98 of the Call for Evidence, namely: (i) the parties (Alice and Bob) agree commercial terms in a non-binding business process document; (ii) they instruct a coder to 'translate' those terms into legally-binding code (the difficulties of which are discussed in our responses to chapter 3); but (iii) due to an error by the coder the code does not perform as expected, we consider that the following issues concerning breach arise:

5.9.1 Irrespective of whether the terms of the code are interpreted as a computer would interpret them, or as a reasonable coder would, there is a prior question as to whether the coder's error amounts to a breach at all (for the purpose of the contract between Alice and Bob). Rather, that error simply forms part of the terms of the contract, performance of which would not amount to a breach of the contract of which it is part (absent one of the factors below applying to change the position).

5.9.2 The contract itself would thus have to provide for the circumstances in which errant performance amounts to a breach, and which party is liable. It is difficult to conceptualise that sort of risk allocation framework being set out in algorithmic code, further reinforcing our view that SLCs should comprise both natural language and coded elements.

5.9.3 Rather, the error may amount to a unilateral or common mistake, which may give rise to a claim for rectification (both of which are discussed above). If rectification is ordered, the past erroneous performance may be treated as a breach giving rise to liability on the part of whichever party's obligations were incorrectly performed.

5.9.4 Issues of causation are likely to arise in that scenario. The defendant party could argue that the coder's error was an intervening event which broke the chain of causation, such that the defendant is not liable for any resulting loss. The claiming party may have a separate claim against the coder in contract or tort.

5.9.5 Additional difficulties may arise where a coded contract is itself a data source for a subsequent program. It is not clear whether the knock-on defect would also amount to a breach and, if so, who is liable.
In addition to the ‘translation’ error scenario above, breaches may arise where data sources or oracles malfunction. If responsibility for such breaches is not allocated in the contract, disputes about the existence of a breach and causation of loss will likely follow.

5.10 Are you aware of, or do you foresee, any difficulties in applying the law on frustration to smart contracts? [5.112]

There is no reason the basic criteria for frustration (namely the occurrence of a supervening event outside the parties’ control which renders performance impossible or radically different to that contemplated at the time the contract was made) cannot apply equally to SLCs. Of course, it may mean that the courts have to consider a number of new and different supervening events (for example, the failure/closure of a third party platform) than the ones that the case law has previously focused on and to consider which of those events should be treated as being within the control of a relevant party. In any event, it is clear from a number of English cases that the doctrine of frustration is often of little practical value when dealing with commercial parties who have gone to the effort to set out (perhaps in a force majeure clause) the effects of the impact of supervening events.

Where the SLC comprises both natural language and coded elements, there is nothing to prevent the parties from including force majeure provisions in the natural language portion of the contract, as in traditional contracts. Indeed, the scope for debate as to whether an event has the required impact (for example, preventing, hindering or delaying performance in the case of force majeure, or rendering performance impossible or radically different in the case of frustration) may be reduced. If the coded portions of the contract continue to execute, that is likely to defeat any claim for frustration or reliance on a force majeure provision. Indeed, the triggering events for a force majeure clause could themselves be automated, which may reduce the scope for debate as to whether or when the triggering event occurred. Contracting parties should address the knock-on effect of force majeure on automated contractual provisions and consider including appropriate “pause” commands.

It may be difficult to include a complex force majeure provision directly in the coded terms of the contract. While this could be done in non-executing ‘explanatory’ language in the code, this may pose practical difficulties in identifying and interpreting the terms of the force majeure provision. We expect, therefore, that sophisticated parties will (at least initially) opt to include these in the natural language portion of their SLCs.

Disputes may, of course, arise as to whether an event was truly outside the control of one of the parties. For example, it may be argued that a cybersecurity breach or a failure of the platform on which the SLC executes was caused by the conduct of one of the parties. In principle, however, that is no different to the types of dispute that arise where frustration is invoked in respect of a traditional contract.

5.11 Can you provide examples of terms that parties have included (or might include) in the natural language element of the smart contract to address the risk that subsequent events might affect the performance of the code? Please explain:

(1) the drafting of the provision;
(2) the subsequent events covered by the provision;
(3) the effect, under the provision, of the subsequent event on the contract; and
(4) the remedies available to the parties under the provision [5.113]

A term may be included to address the situation where coded terms or linked data sources do not perform as expected or intended. Such a provision should address. 40

40 Blycha and Garside, 35.
5.11.1 that the assessment of whether a clause is performing as expected or intended should be done by reference to the natural language component of the contract (ideally, the corresponding natural language term for the malfunctioning code);

5.11.2 (if relevant) the identification of the relevant data source and any relevant costs in respect of installation, running or maintenance of the malfunctioning data source;

5.11.3 notification requirements upon a party becoming aware of malfunctioning code or a malfunctioning data source; and

5.11.4 the reasonable steps to be taken upon such notification of malfunctioning code, for example, to "make good" the outcome of the malfunctioning code, or to correct any defect, bug or security flaw causing the malfunctioning code to ensure the original intention of the contracting parties as evidenced by the natural language terms are reflected, which may include entering into variations to the SLC.

A term may be included to deal with variations (including unintended variations). Such a term should provide for: 41

5.11.5 the nomination of specific data sources or threshold changes triggered by those data sources (where those data sources might be specific clauses or contracts with commercial sensitivities) that require some element or combination of elements of: (i) notification in writing; (ii) by an authorised person; (iii) or following particular procedures, before a legal variation can be said to have occurred;

5.11.6 the nomination of specific data sources or threshold changes triggered by those data sources that require no notification as they do not constitute a variation;

5.11.7 a mechanism for rolling back to an earlier contract state (for example, where malfunctioning code or a malfunctioning data source has caused updates to the contract state that are inaccurate);

5.11.8 abortion or reversion of specific processes or payments to "make good" the outcome of malfunctioning code or a malfunctioning data source;

5.11.9 whether performance should continue on the basis of the natural language components of the contract alone pending correction of the code;

5.11.10 how coded provisions, their status and data inputs and outputs will be handled, including access, permissions, hosting and usage limitations;

5.11.11 who will be the relevant authorities for triggering each element of code that requires human input; and

5.11.12 permissions (including where a third party arbitrator will be allowed to make changes in accordance with court orders etc.).

Terms may be included to deal with cybersecurity breaches which affect the operation of the platform or the SLC. Such provisions should address:

5.11.13 what security protocols should be in place and who is to be responsible for them (this may be set out in the agreement between the platform host and the participants, but parties may choose to specify this in their contract);

5.11.14 notification requirements when a party becomes aware of a cybersecurity breach; and

5.11.15 whether performance should be suspended pending restoration of security protocols.

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41 Blycha and Garside, 36.
Platform malfunction should also be addressed, including:

5.11.16 what degree of loss of functionality is required; and

5.11.17 whether and how the SLC should be able to "roll-back" to only the natural language provisions or be exported to another platform in case of a breakdown of the digital platform, whether due to an IT security incident, insolvency of the platform operator or other reasons.

In addition to terms dealing with the above specific events, we expect that, as a matter of best practice, parties will wish to include some or all of the following "smart boilerplate" provisions in the natural language portion of the SLC:42

5.11.18 Recitals: these are often useful in setting out the assumed state of facts on which the parties are choosing to contract. A key recital may include a statement that the parties are entering into an SLC, defined appropriately, which will run on a specified platform.

5.11.19 An index or schedule of all of the coded portions of the contract, their natural language counterparts, and the agreed digital connections or transactions. This would assist in verifying that all of the necessary code has been incorporated into the contract, and to map out the points of connection and automation in the SLC, which may be useful in the event of malfunctioning code. This would also help to categorise different items of code and apply uniform rules to each category (for example, specifying which are breach-able and where liability lies).

5.11.20 Definitions: covering key concepts such as "Conjoined (or Paired) Terms," "Machine-Readable Language," "Malfunctioning Agreement Code." "Malfunctioning Data Source," "Natural Language," "Incorporated Code," "Smart Legal Contract" etc. There should also be definitions to cover the data used and generated by the SLC, including for concepts such as "Contract Run Data," "Data" and "Data Source."

5.11.21 Interpretation provisions: these would make clear that the SLC contains both Natural Language and Incorporated Code and/or Machine-Readable Language which is intended to be read together. They would also specify the platform on which the SLC would run, and the rules relating to that platform.

5.11.22 Precedence clauses: specifying the precedence of Natural Language and Machine-Readable Language, as discussed at paragraph 4.1 above. Note, however, that in English law, such precedence clauses are used in construction as a last resort where it is not otherwise possible to ascertain the parties' intentions from the contract as a whole. Notwithstanding that, the precedence clause envisaged here is considerably different than the standard clause traditionally used in commercial contracts which seeks to distinguish and assign importance to multiple potentially conflicting natural language terms. Whilst there is no case law on such issues at this stage, it would be surprising if an English court chose to ignore the intention of a clear clause which gave precedence to natural language terms over computer code. That said, a precedence clause is not a silver bullet and doubtless the same arguments used in current cases to defeat such a clause (namely that there is no "conflict" between two clauses but, for example, they are complimentary/additive/dealing with different things) would apply equally here.43

42 Blycha and Garside, 30-33.
5.12 Are you aware of, or do you foresee, any difficulties in applying the illegality doctrine to claims made in relation to smart contracts? [5.117]

None beyond those addressed in the Call for Evidence.
6. **CHAPTER 6: CONSUMERS AND SMART CONTRACTS**

6.1 Are you aware of any business to consumer smart contracts currently in use or in development? Please give details. [6.5]

Other than the examples discussed in paragraph 2.7 and the Call for Evidence (and similar examples for certain use cases), some of which may include a business to consumer use which may or may not be live, we are not aware of any live business to consumer smart contracts currently in use.

6.2 When would you estimate that smart contracts might be in common use in business to consumer contracts? [6.6]

We are not in a position to estimate when smart contracts might be in common use in business to consumer contracts.

6.3 What challenges do you foresee in applying consumer protection laws to consumer contracts entered into wholly or partly in code? Are there any additional existing protections, beyond those we have discussed, which you think are or will be particularly important in the smart contract context? [6.39]

We are not in a position to comment in detail on how consumer protection laws might or should apply to consumer contracts entered into wholly or partly in code. We would expect consumers to be afforded a higher level of protection, especially as many of the decisions about smart contract terms and platforms are likely to be made by businesses in business to consumer contracts.

6.4 What, if any, additional protections do you think are required for consumers entering into smart contracts? In particular, do you consider that there is a case for an explicit legal requirement that terms of a consumer contract which are fully or partly in code must be explained in natural language before the conclusion of the contract? [6.40]

We are not in a position to comment in detail on additional protections which ought to be afforded to consumers entering into smart contracts, but recognise that the proposition in this question is likely to be a reasonable one. An appropriate balance ought to be struck between protecting consumers and facilitating the adoption of smart contracts, perhaps with the introduction of international standards.
7. **CHAPTER 7: JURISDICTION AND SMART CONTRACTS**

7.1 Are you aware of, or do you foresee, any difficulties in identifying the place of formation of a smart contract? [7.27]
We do not foresee difficulties beyond those identified in the Call for Evidence. However, we note that concerns in relation to jurisdiction may be more likely to arise in certain types of smart contracts – such as code-only contracts – owing to the manner of their formation (please see our response in paragraph 3.3 in respect of formation).

7.2 In what circumstances do you think that jurisdiction to hear a dispute in relation to a smart contract could be based on the actions and location of an agent? [7.30]
We agree with the view expressed in the Call for Evidence that where two computer programs have autonomously reached an agreement, they should not be considered ‘agents’ of the parties for the purposes of the rules on jurisdiction and the usual rules of jurisdiction could apply to the location of operation of the automated computer programs.

7.3 Do you think that a rejection of state law in favour of the rules contained in the platform’s protocol is or should be a choice that can be given effect to under article 3(1) of the Rome I Regulation? [7.42]
We agree with the view expressed in the Call for Evidence that for the purposes of the Rome I Regulation as it currently exists, a choice of the rules contained in the platform’s protocol would not be a choice of law that could be given effect to under article 3(1) of the Rome I Regulation. The UK could, of course, legislate to amend the retained EU law version of the Regulation so as to allow a choice of a non-national system of law, but this would have broader implications and in our view would not be desirable.

In any event, we consider that it is not necessary for the parties to have rejected state law in favour of the rules contained in the platform’s protocol. We note that the Rome I Regulation does not preclude parties from incorporating provisions of a non-state body of law or an international convention into their contract. Further, these provisions can be incorporated by reference to a set of rules as well. This body of law (or platform rules) may then co-exist with a choice of English law (or other national law). We also consider it possible for the set of rules to include a stated choice of (national) law which could apply by default to any smart contract concluded via the platform, subject to party agreement.

7.4 Can an express choice of applicable law be embodied in computer code? If possible, please provide any practical examples of a coded clause expressing a choice of applicable law. [7.45]
While it may be technically possible to express choice of applicable law in a computer program (such as by way of comments in the code or a declaration of an appropriate variable (the latter being not ignored by, but likely not otherwise relevant to the implementation or execution of other provisions by, the compiler programme or interpreter programme when reading the source code)), we would recommend embodying this choice in a natural language provision. Doing so may contribute to a finding of intention to create legal relations (as discussed at paragraph 3.9) and avoid issues around the interpretation of comments in code (as discussed at paragraph 4.1). With the increased focus on rules as

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44 Rome I Regulation recital (13), and nor is there any difficulty with incorporating by reference a set of rules (see Dicey, Morris and Collins, *The Conflict of Laws* (15th edn, Sweet & Maxwell 2012), paras 32-050 and 32-056).
code and formulation of legislation and regulation in code, we anticipate that express choices of jurisdiction in computer programs will have increased relevance in the future.

7.5 What factors are capable of connecting a smart contract to a particular jurisdiction, for the purposes of article 4(3) and 4(4) of the Rome I Regulation? [7.59]

We consider that many of the same connecting factors that apply to regular contracts will continue to be applicable to smart contracts, depending on the circumstances. An additional factor in the context of smart contracts may be the location where the relevant smart contract platform is based. We acknowledge that this is unlikely to be a significant factor in most cases, however, it may be of assistance where few other connecting factors are determinable.

7.6 Are you aware of, or do you foresee, any difficulties in the context of smart contracts in applying the choice of law rules that apply under the Rome I Regulation to contracts of carriage (article 5), consumer contracts (article 6), insurance contracts (article 7) and individual employment contracts (article 8)? [7.61]

We consider the same issues arising under the Rome I Regulation for traditional contracts to be applicable to smart contracts, save in relation to consumer contracts. Under article 6, there may be questions on whether the professional "directs" their activities to the country where the consumer is domiciled, merely because the consumer can access the smart contract platform to conclude the contract from that country.

We note that it is unlikely for an employment contract to be concluded as a smart contract in the near future and so, article 8 probably is not likely to be immediately relevant in this context.

7.7 Do you think that a rule of jurisdiction based on the place of contractual performance can be applied where the performance takes place on a distributed ledger? [7.72]

We agree with the view expressed in the Call for Evidence that in many cases, the performance of contractual obligations will be triggered automatically by the smart contract but will result in practical consequences in the real world, for example, payment of traditional currency or delivery of goods. In such cases, the place of performance of the contract may be determined in the traditional fashion.

However, we consider that where contractual performance occurs wholly on a distributed ledger, for example, through a transfer of cryptocurrency, the place of performance should be the same as the location of the cryptocurrency after it has been transferred. The recent decision of the High Court in *Ion Science Ltd v Persons Unknown* suggests that under English law, the place of performance is most likely to be the place where the person or company who owns the cryptocurrency is domiciled, although we note the case does not decide this point definitively.45

We note as an aside that the common law jurisdictional gateway at paragraph 3.1(7) of Practice Direction 6B refers to the place of the breach of contract, rather than the place of performance. This place will ordinarily be the same as that of performance. An exception arises where there is an express repudiation of the contract occurring in a place other than

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the place of performance. In this respect, we understand that an express repudiation would likely take place external to the smart contract itself i.e. in the ‘real world’ (noting that it may not be effective to cease performance if the contract has already executed) and as such, there should not be any particular difficulty in determining the place of repudiation of the agreement.

7.8 What factors do you think are capable of connecting a claim in relation to a smart contract to a particular jurisdiction? [7.85]

Please consider our response in paragraph 7.5 above as applying equally to this question.

7.9 Which, if any, rules for establishing jurisdiction do you consider will be most problematic in the smart contracts context? Do you agree with our analysis of the issues as described in this call for evidence? [7.86]

We broadly agree with the analysis of the issues in the Call for Evidence, save for the fact that the situation in relation to Brexit has advanced since the call was released in December 2020, and the rules relating to jurisdiction under the Brussels/Lugano Convention may no longer be relevant (if the UK is unable to re-accede to the Lugano Convention).

We note that in case a judgment needs to be enforced in a foreign jurisdiction, the rules for establishing jurisdiction in the English court form only a part of a larger picture. At that stage, the basis on which the English court assumed jurisdiction may affect the willingness of the relevant foreign court to enforce any judgment, particularly where the defendant did not participate in the proceedings.

A separate but potentially related jurisdictional question may arise where the parties expressly provide in their natural language drafting any “on shore” rules as to where (or in what jurisdiction) any contract code or data may be stored, but the relevant supporting platform stores or shares data or code outside of those rules.
8. CHAPTER 8: FINAL QUESTIONS

8.1 Are there any issues we should be considering on smart contracts beyond those we discuss and ask about in this call for evidence? [8.3]

We consider there may be value in assessing in greater detail the ability of courts and other dispute resolution fora to enforce the obligations under a smart contract (including a suspension or termination of any coded elements of a smart contract). We are aware that the UK Jurisdictional Taskforce has commenced a consultation on a draft set of Digital Dispute Resolution Rules which can be incorporated into on-chain digital relationships and smart contracts. These appear to be based on the use of arbitration and/or expert determination.

In this respect, we think it would be helpful if there was a clear understanding of the powers of the court (or any other body) when dealing with disputes relating to smart contracts. In particular, our view is that it would be helpful if the jurisdictional basis for any enforcement and/or interim relief activities could be set out in further detail. In addition, thought needs to be given to how a court or tribunal could affect the operation of a smart contract running on a blockchain. For example, should a situation occur where parties are in dispute as to the correct operation of code and one party applies for interim relief that the operation of that code should be suspended, does the court/tribunal have the power to make that order and/or how does it enforce it in circumstances where another party refuses to agree to such suspension?

8.2 Which other jurisdictions should we look to for their approach to smart contracts, and why? [8.4]

We have been particularly active in the Australian market, as has the Australian Government. Therefore, we consider that Australia is an appropriate jurisdiction to look to. Additionally and following the Quoine case, the Singaporean market appears to be more developed and may be useful to consider.

8.3 Are there any legal reforms that you consider immediately necessary to remove uncertainty and unlock some of the potential benefits and cost savings of smart contracts? [8.5]

Potentially. A number of our answers above suggest fewer barriers to SLC adoption if parties are able to use a properly developed smart contract platform. We anticipate that a properly developed smart contract platform will require a well thought through set of features, such as those outlined in DIIP 2021.

It is possible that legal reform will be required to ensure that digitalisation of contracts requires those 'public interest' aspects identified in the protocol, particularly if the market alone does not deliver these requirements. Legal reforms may also be required to catalyse government funding to ensure similar high integrity platforms that support digital legislation and digital disputes can be built and adopted.

We welcome involvement in any future conversations with the Law Commission about the impact of digital on the rule of law, including the impact on citizen’s data, privacy, access and certainty in respect of their legal rights and obligations, particularly if public funds are not directed to supporting platforms or digital infrastructure that universally support the people, and private funds alone are unable to deliver public interest requirements.

Digital infrastructure that supports justice will be just as important in the future as the public provision of secure and accessible brick and mortar court buildings and parliamentary buildings now.
We thank the Law Commission for instigating this highly relevant and critical Call for Evidence and would welcome the opportunity to discuss any of our responses.

Herbert Smith Freehills LLP
The Law Society of England and Wales’ response to the Law Commission Call for Evidence on smart contracts

1. This paper sets out the views of the Law Society of England and Wales on the Law Commission’s Call for Evidence on smart contracts published on 17 December 2020.

2. The Law Society of England and Wales is the professional body for the solicitors’ profession in England and Wales, representing over 160,000 registered legal practitioners. The Society represents the profession to parliament, government and regulatory bodies and has a public interest in the reform of the law.

3. The Law Society welcomes the opportunity to respond to the Law Commission’s Call for Evidence (the “Call”) on smart contracts, and we note the Commission intends the Call to inform its scoping study on smart contracts due later this year.

4. We particularly welcomed the opportunity to meet Professor Sarah Green and the Law Commission team responsible for drafting the Call during the preparation of our response, and we hope this will mark the beginning of an ongoing dialogue as the Commission prepares its scoping study and develops its thinking in this area.

5. Instead of using the Commission template, we have structured our response to reflect our analysis of the main issues raised by the Call for Evidence. In so doing, we have regrouped the questions in line with our feedback.

Executive Summary

6. The Law Society’s response to this Call has been informed by the need to ensure that fundamental principles of legal certainty, fairness, transparency, and accountability are central to the consideration of smart contracts. We also see this area as one in which the English and Welsh legal sector which our members operate in can add direction and help foster an environment in which new business processes and technologies can thrive.

7. Given that this is a new and maturing area of law, we recommend that the Law Commission adopts a broader definition of “smart contract” than is contained in the Call for Evidence. We suggest that a more complete and wide-ranging debate could be developed if there was a broader view of what is constituted by a smart contract. We believe this should incorporate a view of smart contracts in line with current usage and with the Law Tech Law Tech Delivery Panel’s definition as set out in its Statement of November 2019.1

8. We consider this to be a more useful point of departure given the adaptability of English and Welsh law, and the benefits such a technology-neutral definition could

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1 Law Tech Delivery Panel, Legal statement on cryptoassets and smart contracts (November 2019)
bring to future proofing legal questions regarding smart contracts, and we provide case studies in support of this approach in our definitional argument below.

9. Our view is that the use of the terms "natural language" and "code" need to be considered at a more nuanced level than that provided in the Call. In particular, high-order programming languages (such as Solidity in the context of smart contracts) should be considered as more similar to traditional natural language contracts (for example in their appearance as abbreviated English sentences). We would welcome further discussions with the Law Commission on this issue if helpful.

10. As we set out in the legal contractual analysis section of this response, we are of the strong opinion that traditional contract law provides an effective framework for governing smart contracts, and that the features of traditional contracts map across onto smart contract models (even with a much wider definition than that adopted in the Call).

11. In our jurisdiction section, we acknowledge the difficulties of determining the governing law and jurisdiction on smart contracts and suggest that, in the interest of legal certainty, consideration be given to the formation of a model clause to enable parties to set appropriate governing law and jurisdiction, and that there is also scope for a dispute resolution mechanism to be identified in contracts.

12. We further consider that, as technology and transactions develop, the potential increase in the number of actors involved in different locations cautions against any blanket approach to a rule of jurisdiction based on the place of contractual performance (which may serve as a disincentive to smart contract development or where the parties seek to create legal relations).

13. We have grouped our answers to the questions from the Law Commission’s Call for Evidence as follows:

   a. use cases in support of our definitional argument;
   b. the benefits of, and processes involved in smart contract formulation; and,
   c. analysis of legal contracts, remedies, and questions of jurisdiction.

**Scope – definition of smart contracts**

**Question 2.**

Do you agree that the Law Commission’s scoping study on smart contracts should be limited to contracts which use distributed ledger technology? If not, please provide details of other technologies which are used to support smart contracts, and their prevalence.

14. We consider that the Law Commission definition of “smart contracts” in this Call for Evidence is very conservative, given this is a very new and still maturing area. We
note that the UK LawTech Delivery Panel (LTDP) took a markedly different approach in its "Legal statement on cryptoassets and smart contracts".²

15. Instead of developing a strict smart contract definition, the LTDP opted to identify distinctive features of the most pervasive smart contracts without seeking to restrict the phrase to any particular set of features.³ For example, they identified automaticity as the ‘characteristic feature’ of smart contracts. In the Panel’s view, smart contracts are ‘performed, at least in part, automatically and without the need for, and in some cases without the possibility of, human intervention’, thereby requiring the terms of the contract to be recorded in code. The LTDP also stated that, in its view, smart contracts were typically ‘embedded in a networked system that executes and enforces performance using the same techniques (cryptographic authentication, distributed ledgers, decentralisation, consensus)’ it had previously discussed regarding cryptoassets. In other words, the LTDP consciously avoids defining a ‘smart contract’ but does look at what it considers its most characteristic feature – automaticity – within the current confines of English and Welsh law. We think this open-ended definitional approach is usefully dynamic, by addressing how English and Welsh law might already accommodate these distinctive features without delimiting the smart contract technology itself. This approach mirrors the organic nature of common law itself, which is led by practice rather than theory.

16. We further note that in other discussions or, in some cases and jurisdictions, regulation, where a “close-ended” definition of smart contracts has been adopted, such definition tends to be extremely broad. For example, consider the oft-cited definition of smart contracts developed by the industry-led and influential Chamber of Digital Commerce (CDC)⁴. In its White Paper⁵, the CDC distinguishes between a “smart contract” and a “smart legal contract”, defining the former as: “computer code that, upon the occurrence of a specified condition or conditions, is capable of running automatically according to pre-specified functions. The code can be stored and processed on a distributed ledger and would write any resulting change into the distributed ledger.” In other words, a smart contract can incorporate distributed ledger technology, but it is not a mandatory feature definitionally.

17. We provide two examples (Guardtime and IOTA) below of other technologies that are used to support smart contracts. We suspect there are others in existence and others will continue to develop in view of the significant scalability and cost challenges presented by current consensus-based blockchain technology. We consider that a technology-neutral approach to smart contracts is desirable to avoid a

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³ Legal statement on cryptoassets and smart contracts, page 135

⁴ The Digital Chamber of Commerce has over 200 member companies comprised of leading-edge start-ups, software companies, global IT consultancies, financial institutions, insurance companies, law firms, and investment firms. The membership, which is primarily U.S.-based, spans various areas within the blockchain industry. See https://digitalchamber.org/.

situation where legal analysis, approach and legislation/ regulation becomes overtaken by technological developments. The Law Society is interested in the legal implications raised by automating contractual transactions irrespective of the underlying technology, and we would point to the approach taken by HM Treasury in its consultation on stable coins and cryptoassets.  

18. Specifically, the Insurwave use case referenced in clause 2.44 on page 19 of the Call does not deploy a consensus mechanism among nodes. The technology deployed by Guardtime was developed in 1990 by two highly proficient cryptographers and is the precursor of blockchain technology as described in the Call for Evidence. The Guardtime technology is described within the Call as “distributed ledger technology” or “blockchain”. However, it is a fundamentally different technology in that it deploys a “third party publishing mechanism” in lieu of a consensus mechanism to ensure the integrity of the ledger, i.e., to prevent anybody from changing the history of the ledger. In our view, the Call for Evidence heavily emphasises the deployment of consensus as "an autonomous mechanism”. Guardtime however does not rely on any consensus mechanism for the deployment of smart contracts.

19. A more recent example of “off chain” smart contract technology development is the IOTA Foundation smart contract. IOTA positions itself as “An Open, Feeless Data and Value Transfer Protocol” specifically designed for the Internet of Things. An open-source distributed ledger and cryptocurrency, IOTA claims to have fundamentally reengineered what one would regard as distributed ledger technology and solved the scalability, cost and energy expenditure challenges posed by blockchain consensus mechanisms. The IOTA “off chain” or Level 2 “smart contracts” are implemented off chain by a “committee” of validators selected on an open market of validators.

20. The Law Commission definition primarily focuses on legal implications of automating contracts using distributed ledger technology, yet distributed ledger technology, which is itself under constant development, is only one means of contract automation. We do not think automated contracts can be analysed within any legal framework independently from its distinctive underlying technology. A more general definition of smart contracts unrestricted to distributed ledger technology and, in particular, blockchain, could have far greater relevance and indeed “future proof” any legal constructs.

Use cases for smart contracts

Question 4.

Which of the three forms of smart contract discussed in para. 2.32 of the call for evidence are most commonly used in existing smart contracts or smart contracts

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6 UK regulatory approach to cryptoassets and stablecoins: consultation and call for evidence, January 2021
7 See https://www.iota.org/
8 See https://blog.iota.org/iota-smart-contracts-protocol-alpha-release/
which are in development? Please provide examples of how these forms of smart contract have been used in practice.

21. Our view is that the use of the terms "natural language" and "code" needs to be considered at a more nuanced level. A distinction needs to be drawn between code that is written in a higher order programming language (such as C++ and Java, and in the context of smart contracts, Solidity), and that which is written in a lower level (e.g. assembly/object code). Higher order programming languages are designed to be read by people (albeit with a background in software development) and, we believe, should be treated as closer to natural language (as defined), and perhaps considered more like a foreign language.\(^9\)

22. There are an increasing number of "no-code" solutions in the market, some of which could be used to generate smart contracts\(^10\). Of course, while there is code in them, they do not require coding experience to use them. For the user they are more akin to natural language (albeit sometimes presented through more of a wizard approach akin to, for example, the step-by-step assistance given through the graphical user interface when creating a pivot table in modern versions of Microsoft Excel).

23. Although a hybrid model may appear convenient to allow the legal system to best adjust to smart contracts, it does of course bring in the issues of conflict and precedence. We note the possibility of formally incorporating natural language statements within code as items that are not compiled (and therefore not turned into computer processor instructions).

**Question 5.**

How do code and natural language interact in hybrid smart contracts currently in existence or in development and which terms are generally coded?

24. The level of interaction can vary. In one extreme, the natural language merely points to code that assists the automation of certain performance obligations. At the other end of the spectrum, the code contains non-compiled natural language e.g., as code comments.

25. As detailed in our response to question 4 above, higher order programming languages should be considered as being similar to natural language in many ways.

26. The role of libraries in the code should not be underestimated. Software development uses precedent code libraries much more than would be the case in

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\(^9\) Note also the view expressed by many leading AI/logic academics, that “we need to stop teaching humans to think like computers; we need to teach computers to think like humans” (Prof. Robert Kowalski & his work on Logical English, seen here in an academic paper with Akber Datoo in the context of the ISDA Master Agreement e.g. https://www.doc.ic.ac.uk/~rak/papers/Logical%20English%20meets%20Legal%20English.pdf).

\(^10\) For example, [Unibright the creation of DAML smart contracts with “no code” developer tools](https://blog.digitalasset.com/press-release/unibright_daml)
natural language contract drafting. Software developers will likely rely on natural language descriptions of what particular libraries offer, combined with experience of their usage.\footnote{In the context of smart contracts, these are available for example through the Accord Project.}

27. We recommend that the increased use of natural language in higher order programming language code such as comments should also be encouraged. These are typically used by reviewers of code as a guide to what the code section is intended to do (and to the extent they are not utilised, should be regarded as poor practice in the same way that drafting without appropriate section headings and thought for readability would be considered so).

28. When considering comments, labels and other markers within code, it may be useful to consider parallels such as Burton J in Citicorp International Limited v Castex Technologies Limited, 24 February 2016. In this case, Burton J commented that he would "…\textit{find it impossible not to be assisted}" by the heading to Condition 8.11 even were clause 1.3 of the trust deed to apply. We note his reference to Doughty Hanson & Co. Ltd v Roe [2007] EWHC 222 (Ch), where Mann J determined the relevant clause was admissible "\textit{as descriptive of what the provision is about}". This could support the proposition that (natural language) code comments may be used as an interpretive aid, as well as assisting with determining the intention of the parties.

Question 7.

Are you aware of any examples of use cases for smart contracts beyond those we give in the call for evidence, or variations on the use cases we give, which are being developed, are at proof of concept stage or are already operational?

If so, please explain:

(1) the technology used to create the smart contract;
(2) the role played (if any) by oracles in the performance of the smart contract;
(3) the contractual terms (if any) performed automatically by computer programs; and
(4) whether the smart contract is a business to business commercial contract, a peer to peer contract or a business to consumer contract.

29. We would refer to our answer to Question 2. above, specifically to Guardtime and IOTA.

30. On the role played by oracles in smart contract performance, please see our answer below to Question 56.
Benefits of smart contracts

Question 8.
What benefits and cost savings can smart contracts provide compared with traditional contracts? Will increased use of smart contracts lead to any additional costs? Please provide details and any available qualitative and quantitative evidence.

31. We see the benefits as: speed of execution/automated execution; automated performance and monitoring; increased transparency and visibility; increased certainty in relation to final form of contract (as codified); and, reduced "performance risk" on a counterparty.

32. Cost savings for smart contract users are a benefit, however, for many users, this is dramatically outweighed by the benefits offered in respect of additional business value they provide regarding optimisation of resources and rights within contracts. That said, they are involved with the actual performance of contractual obligations than traditional contracts (which merely document such contractual obligations). Any new costs of software validation and verification need to be considered accordingly and considered in the context of costs of performing contractual obligations (which will clearly vary based on the context).

Process of developing smart contracts

Question 6.
What process do the parties follow (or plan to follow) in negotiating, drafting and entering into a smart contract? Please explain in particular:

(1) where all the contractual obligations are contained in a natural language agreement and the code is intended merely to perform those obligations, the practical steps involved in coding the parties' rights and obligations contained in the natural language agreement;

(2) where the parties intend that there will be a hybrid contract or a solely code contract, the practical steps involved in drafting, negotiating and agreeing the code of the smart contract;

(3) where there is a hybrid contract, whether the natural language element and the coded element are entered into contemporaneously or at different times; and

(4) the role played by third party service providers (such as computer coders and software firms) in this process.

33. We note that this is a fast-evolving area in terms of practice.
34. As with software development outside of smart contracts, it would be usual to have a business requirements document which sets out (in traditional natural language and in non-technical terms) what the system is meant to achieve for it to be "a success" or "meet the requirements of the business" (in the context of a smart contract, the "business" would be the person entering into the contract).

35. An example of a business requirement might be: "the car is easy to park". This business requirements document is then typically handed to a technology team, who create a "Functional Specification Document". This would detail how the system is designed to meet the business requirement. Using the example provided, the car might be made less than a certain length, or it might have a parking camera added to it, or "auto park functionality". It would be normal to expect the business to read and sign off on the approach proposed by the technology team (which might be outsourced to a third party) to meet the stated business requirement. It should be noted that for cases where the performance automated by systems is in a critical area where unexpected outcomes (due to bugs in code) can have significant consequences, it is common to utilise (typically third party) code verifiers\textsuperscript{12} / auditors. We understand this is common for higher value ICOs. Our view is that good software.smart contract development practice would utilise a similar approach for the development of a smart contract.

**Legal contractual analysis**

**Question 11.**

Do you consider that offer and acceptance can occur through the operation of autonomous computer programs deployed by the parties on a distributed ledger? If so:

(1) in what circumstances?

(2) on what legal basis?

36. We do not believe there should be any reason why offer and acceptance cannot be approached in the usual way in respect of smart contracts. The consensus that “offer and acceptance” seeks to find is not in our view affected by whether the contract is a natural language one on hard paper, or whether it is stored at an address on a distributed ledger that parties can view (or have stored at that address).

37. At a technical level, the contracting parties to a smart contract on a distributed ledger, are not individuals (with capacity), but rather cryptographic private keys that represent individuals. However, they do not act by themselves, they are typically “instructed” by people.

\textsuperscript{12} Note that code verification can be completed to some extent using “formal verification” which is the act of proving or disproving the correctness of intended algorithms that form the basis of a system with respect to a formal specification. This is done using formal methods of mathematics. See work by Shao and Gu regarding a formal verification protocol (CertiKOS) for blockchain. These formal methods can struggle to scale for complex contracts / specifications.
38. We do not provide a view on the specific focus of this question on autonomous computer program contracting and whether offer and acceptance can occur in such a context. We note, however, that this is a much wider topic regarding autonomous systems as legal agents and suggest that the narrow question regarding whether offer and acceptance can occur through the operation of autonomous computer programs is dependent and ought to be influenced by many far-reaching questions in respect of such a wider topic (such as the question of liability).

Question 13.

What evidence might be available to a court to establish the identity of the parties to a smart contract entered into pseudonymously on a DLT system?

39. As detailed in the Call for Evidence, it may not be possible to uncover the identity of parties to a smart contract entered under a pseudonym on a DLT system. We envisage sophisticated parties to be aware of these issues and therefore ensure validation of identities of counterparties to a smart contract as part of their due diligence. In respect of consumer or unsophisticated parties, the issues (pseudo-) anonymity may cause in this regard should feature in any risk disclosure requirement (see our response to Question 46. below).

Question 14.

Are you aware of, or do you foresee, any difficulties in applying the law on consideration to smart contracts? If possible, please provide examples.

40. We do not consider that there should be particular difficulties - the format of the agreement does not necessarily impact on the analysis as to whether consideration has been given (either within the terms of the agreement or outside of it)

Question 15.

Are you aware of, or do you foresee, any difficulties in determining whether the parties to a smart contract have reached a certain and complete agreement? If possible, please provide examples.

41. We consider that this may, in fact, be easier with smart contracts given the codification of terms. The very process of codification of the agreement is likely to provide ample evidence of this in most cases.

Question 16.

Are you aware of any instances where the parties to a smart contract have expressly agreed that they do not intend to create legal relations?
42. Yes, this is common and often a result of a lack of understanding of smart contracting. Parties may often not realise that having an embedded dispute process does not mean that they do not intend to create legal relations (as they would typically expect some rights/legal recourse if that embedded process was not followed).

43. Our view is that over time, understanding will develop and that parties will specifically intend to create legal relations.

Question 17.
Do you foresee any difficulties in ascertaining whether parties intend to create legal relations when they transact with one another on a distributed ledger?

44. Please see our answer to Question 16. above.

Question 18.
Do you consider that source code could meet the definition of “writing” in the Interpretation Act 1978?

45. The analysis will likely differ depending on how much of the arrangement is represented by code and how much is in a more traditional natural language format. Compliance with specific registration requirements of different public registries — (e.g. registration of security at Companies House, Land Registry requirements) will also be relevant.

46. We note the distinction between higher order programming languages and assembly code. The lower level the smart contract code, the more difficult it would be to meet this definition of ‘in writing’.

Question 23.
Are you aware of, or do you foresee, any difficulties in applying the principles of interpretation to identify whether terms of a particular smart contract are contained in the natural language component or the coded component of the smart contract, or both?

47. We expect this to be clear based on the circumstances (either the natural language or code would not contain the necessary detail for them to be regarded as functioning as the terms of the contract). It would be helpful, in cases where there are interpretation issues between the two, to have an order of precedence set by the parties. Model (code and natural language) clauses would be very helpful in this regard.
Question 25.
Do you consider that the meaning of a coded term of a smart contract would or should be determined by asking what the term would mean to a:

(1) reasonable person;

(2) reasonable person with knowledge of the relevant code; or

(3) functioning computer?

48. We believe the fundamental principle is to construe the true intention of the parties when entering into the arrangement. Therefore, we suspect that the reasonableness test may become more complicated, as the parties’ actual level of knowledge in relation to understanding code will need to be taken into account. Parties are likely to have a wide range of knowledge and understanding of code and coded terms, and it is therefore likely to be very difficult to formulate a blanket test. Indeed, it may well hold back adoption if parties are assumed to have a level of knowledge that they do not have.

49. It should not be determined with respect to what a term would mean to a functioning computer. This may be far from the intention of the parties, and the term “functioning computer” would also bring significant ambiguity to matters, as there are likely to be many “functioning computers” that may reach different states based on the same code based on their configuration and set-up.

50. Considering which of the first two options would be more appropriate, this question highlights the inherent tension between an objective approach to interpreting contracts and taking into account parties’ intentions. We believe the answer needs to be determined by the specific context that may arise. Where the parties have resources and expertise, it should be determined with regard to a reasonable person with knowledge of the relevant code, as the parties are more likely to be in a position to have or bring in the necessary expertise (such as a code verifier). It would be more likely to be determined with respect to a reasonable person in the case of consumer contracts.

51. We think the development of objective criteria that could be applied in this area to distinguish between the two scenarios would be very helpful.

Question 26.
Do you consider that performance of the coded terms of a smart contract cannot always be predicted based on a reading of the code?

If so, can you provide examples or specific evidence of this occurring?

52. We agree that performance cannot always be predicted based on a reading of the code, but we are not clear that this is any different from natural language contracts. Drafting styles of code will evolve in order to ensure greater readability and
also a better ability to predict the outcomes of the smart contract code in different scenarios. We believe items such as code comments and smart contract design (ideally using modules and code classes) will assist with this.

53. We note that natural language contracts are sometimes drafted to provide flexibility for dealing with unexpected events, and we see a need for the same in respect of smart contracts. This might be through the use of oracles, where the data input from the oracle is not automated or system-based (although this would require trust in a third-party (controlled) oracle).

Question 28.

Are parties utilising natural language in smart contracts to make their intentions clear in respect of any coded terms or the contract as a whole?

54. Parties often utilise and rely on comments in the code (these are typically inserted prior to code sections / particular routines / functions and classes to aid readability of code). Please see our answer to Question 5. above.

Remedies

Question 46.

What, if any, additional protections do you think are required for consumers entering into smart contracts? In particular, do you consider that there is a case for an explicit legal requirement that terms of a consumer contract which are fully or partly in code must be explained in natural language before the conclusion of the contract?

55. Yes, we believe such a legal requirement would be a sensible measure.

56. For automated data processing, risk disclosure (before the conclusion of the contract), in particular, will be an important element, especially given the possible inability to halt this once the automated performance is underway.

57. If personal data\textsuperscript{13} is processed in any manner, then data protection rules must also be considered.\textsuperscript{14} To the extent that data protection law is relevant, it will be necessary to ensure that its compliance obligations regarding transparency for data subjects are adhered to at the correct stage in the process, and that consumers are

\textsuperscript{13}‘Personal data’ is defined by the General Data Protection Regulation (GDPR) as ‘any information relating to an identified or identifiable natural person (‘data subject’); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person.’

\textsuperscript{14}Article 22 of the GDPR states that solely automated data processing can be used where it is necessary for a contract between a data subject and controller or is based on the consent of a data subject. Further, Article 22(3) requires controllers in such cases to implement safeguards including a right to human intervention to ‘safeguard the data subject’s rights and freedoms and legitimate interests.’
able to effectively exercise their rights. Finally, any restatement of consumer fairness and transparency principles in the context of smart contracts would also need to take account of data protection principles.

Jurisdiction

58. As noted in the Call for Evidence, we consider that there are problems determining the governing law and jurisdiction on smart contracts. There are challenges in determining key elements including the location of where (a) the contract is formed, (b) the property is situated, (c) the harm occurs and (d) the loss is crystallised. In its report, the LTDP acknowledged that “these complex issues will best be resolved by legislation, most likely following international cooperation” and tentatively suggested a number of factors that may be relevant in determining whether English and Welsh law governs. These include: (a) whether any relevant off-chain asset is located in England and Wales; (b) whether there is any centralised control in England and Wales; (c) whether a particular relevant asset is controlled by a particular participant in England and Wales (because, for example, a private key is stored there); and, (d) whether English law is applicable to the relevant transfer (perhaps by reason of the parties’ choice).

59. Where the parties do not specify the governing law in the smart contract, and the claimants in a dispute are asking the court to rule in a matter which has a foreign element, we may see the courts looking at how best to apply the conflict of law rules to the particular factual situation. This is seen most recently in the in Ion Science Limited & Duncan Johns v Persons Unknown & ors case before the Commercial Court. The case concerned an allegation of fraud in an initial coin offering (ICO). The claimants sought interim relief: a proprietary injunction and worldwide freezing order over the assets of the individuals connected to “Neo Capital”. The significance of this first-instance that in reaching its decision, the court indicated that the applicable law (based on venue/location) of a crypto-asset is the place where its owner is domiciled. This was the first time a court looked at the applicable law (based on venue/location) of Bitcoin, and the judge drew on the reasoning of Professor Andrew Dickinson (which is also referred to in this Call for Evidence). This case highlights how consideration of all the facts will be relevant, including factors such as (a) where the transactions take place; (b) where assets and currency are purchased and delivered; (c) where the harm takes place; and (d) where the smart contract account is located.

60. We have identified certainty as one benefit of smart contracts. In the absence of any legislation on this and binding case law, we consider that some sort of model clause that helps parties to set appropriate governing law and jurisdiction would be helpful. There is also scope in this area for a dispute resolution mechanism (such as arbitration) again to be specified in the contract.

15 ‘Cryptocurrencies and the Conflict of Laws’ in Cryptocurrencies in Public and Private Law, eds. David Fox and Sarah Green, Oxford, 2019
Question 47.

Are you aware of, or do you foresee, any difficulties in identifying the place of formation of a smart contract?

61. Given, as has been acknowledged, that a contract can be made in two or more places at once, the nature of smart contract transactions and the number of actors involved, it will be difficult to pinpoint one formation point for contracts.

Question 49.

Do you think that a rejection of state law in favour of the rules contained in the platform's protocol is or should be a choice that can be given effect to under article 3(1) of the Rome I Regulation?

62. We believe this is an interesting proposal. Smart contracts are developing and it is to be anticipated that those entering into these are doing on the basis of the platform’s protocols. The traditional legal recourse will however be needed, should the platform’s protocols not be given effect (for whatever reason), or where other issues such as misrepresentation arise.

Question 50.

Can an express choice of applicable law be embodied in computer code? If possible, please provide any practical examples of a coded clause expressing a choice of applicable law.

63. Yes. This could simply be done through the setting of a variable (e.g. v GoverningLaw), to an appropriate value to ensure a common understanding.

Question 53.

Do you think that a rule of jurisdiction based on the place of contractual performance can be applied where the performance takes place on a distributed ledger?

64. As technology and transactions develop, there will potentially be an increasing number of actors located in various jurisdictions (although see the IOTA model referred to in our answer to Question 2.). If the location of actors was considered a potential connecting factor for jurisdiction, this could be a disincentive to the use of smart contracts as there would be uncertainty over which courts had jurisdiction. This can lead to delays and costs in resolving disputes, and a potential increase in satellite litigation.
65. Given the likely use cases in a smart contract and distributed ledger context, we note that this rule may not be appropriate or possible in many cases. We would therefore caution against any blanket approach as suggested by the question.

Question 55.
Which, if any, rules for establishing jurisdiction do you consider will be most problematic in the smart contracts context? Do you agree with our analysis of the issues as described in this call for evidence?

66. We agree with the analysis. Given the inherent difficulties we would suggest that, outside of the consumer context (where rules for establishing jurisdiction may also play an important role in consumer protection), the jurisdiction selected by the parties should be given effect, and parties should be encouraged to agree its relevant jurisdiction before entering into/as part of a smart contract).

Other

Question 56.
Are there any issues we should be considering on smart contracts beyond those we discuss and ask about in this call for evidence?

67. We ask for greater consideration of the way in which parties address the risk of inaccurate and/or poor quality of data inputs into a smart contract (e.g. via an Oracle) and unexpected outcomes that might have on the automated performance. The automated performance is typically triggered by the occurrence of a set of defined events. One establishes whether those events have occurred through data (for example, from an oracle). If there is inaccurate or poor quality data at hand, it is likely that the automated performance will depart from the intention of the parties.

68. We envisage practice emerging to have a contractual relationship with the oracle setting out the various responsibilities and liability of the oracle.

Question 57.
Which other jurisdictions should we look to for their approach to smart contracts, and why?

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69. As previously mentioned, the CDC is a useful example. This is not only because of the substantial resources it has allocated already to distributed ledger technology, smart contracts and token research and advocacy, but also because it is a very broad-based, industry-led group comprised of over 200 members in industry, technology, law, and government.

Question 58.
Are there any legal reforms that you consider immediately necessary to remove uncertainty and unlock some of the potential benefits and cost savings of smart contracts?

70. No, we consider the current state of English law to be more than sufficient to accommodate even a wider definition of “smart contracts” than that envisaged by this Call for Evidence.

Other Observations / Comments

71. In terms of the description of DLTs set out in the Call, we believe it is misleading to say that when data is added to the ledger, every node’s copy of the ledger is updated instantaneously. This is only true from the perspective of block numbers. Nodes are not synchronised amongst themselves – they execute independently and collaborate in growing a chain of numbered blocks. Therefore, at any point in time, the ledger stored by every node will not necessarily be exactly the same. This is why there might be multiple chains in existence, which is resolved by accepting the longest chain as the valid version of the blockchain. This is one of the reasons why coding in languages for distributed ledger technology can often be harder than in non-distributed contexts.
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Chapter 2: What is a smart contract?

Question 1
Please share your views below:

Question 2
Please share your views below:

Question 3
Please share your views below:

Question 4
Not Answered

Please provide examples of how these forms of smart contract have been used in practice:

Question 5
Please share your views below:

Question 6
Please share your views below:
Before even beginning to draft a smart contract, the most important step in the process is to get the team in place and conduct a rigorous planning phase. In order to successfully draft a smart contract, the collaboration between lawyers & coders is critical and all parties must understand each other and their goals. To facilitate this, law firms are now starting to invest in their own coder resources. The benefit of this is that interests are aligned and coders gain the expertise to give effect to legal contractual clauses and draft smart contracts with legal rigour intact. Assumptions cannot be made and the success of the smart contract will be heavily linked to the precision and accuracy of the drafting. The collaboration will also extend to user testing. We would expect that most smart contracts involving lawyers would be hybrid. Natural language is essential in interpreting the coding and in explaining the intent behind the smart contract. A hybrid contract enables drafters to retain the ambiguity of natural language, whilst also ensuring the preciseness that is required to automate actions upon a trigger.

Key considerations include the following:
- Events of default. It is very difficult to programme the exercise of discretion into code. The parties need to decide whether or not events of default should be triggered automatically through code. There may be circumstances in which it is desirable that certain contractual breaches should not automatically give rise to an event of default. This may particularly be the case where the breach was unintentional (failure of a sensor or input or other automated step) which can be remedied quickly (provided manual intervention is permitted under the contract) but where unnecessarily and automatically closing out the contract would result in significant expense for one or both parties.
- Specification of what takes precedence between natural language & coding in the event of a dispute. In our view, the code should put the natural language into action
- Adaptation of the ways that natural language clauses are drafted to account for the coding element

Question 7

Please share your views below::

Question 8

Please share your views below::

As a whole, we certainly see benefits outweighing costs – particularly as smart contracts become increasingly popular and the required skillset for developing these types of contract become more common.

Benefits
- While natural language relies on human capital to action the obligations, smart contracts provide the ability to automate this based on a specific trigger, for example an input from a sensor or automatic notification from another system. Removing human capital means that automation can reduce the reliance on humans performing obligations that have been provided for in the smart contract – thus leading to both greater efficiency and reducing the risk of human error. For example, in its “Legal Guidelines for Smart Derivatives Contracts: Foreign Exchange Derivatives” paper, ISDA describes some features of FX that lend themselves to automation such as the automation of the calculation and triggering of the payment of a settlement amount between counterparties that would otherwise rely on their internal data models & manual processes to settle the trade.

https://www.isda.org/a/bPYTE/ISDA-Legal-Guidelines-for-Smart-Derivatives-Contracts-FX.pdf

- Smart contracts allow a degree of transparency and obligation management that simply isn’t possible in natural language contracts. Automatically executable conditional terms (such as payments and asset transfers) and process flows can remove the need for third parties to act as conduits for funds and ensure greater transparency across a supply chain (playing a key role in reducing the risk of corruption across the chain). This could have a large impact across a wide range of industries. For instance, in the music industry, the purchase of a track will trigger the forwarding of payment to each shareholder within the chain as specified on the smart contract agreement. Examples of this in action include Musicoin, Resonate and Ujo music which all utilise smart contract technology to automatically direct payments to content contributors and artists.

https://www.researchgate.net/publication/326225903_The_Impact_of_Blockchain_on_the_Music_Industry/link/5b41b9d60f7e9bb59b145842/download

- The main cost of smart contracts is monetary. These costs manifest themselves in a number of different ways. Examples of some of the monetary costs of creating a smart contract are: building the underlying network (this will not necessarily be built by parties to the smart contract – a third party platform may be used); development costs (need to pay for both coding & legal work, infrastructure and testing).
- Another cost is that by the very nature of Smart Contracts, there is a need to engage multiple stakeholders. The complexity of marrying natural language with coded elements means that lawyers and coders need to collaborate to draft a smart contract. Not only do the terms of the natural language need to be agreed, the coding needs to work well in tandem with the natural language to ensure that the code contains the appropriate triggers and workflows. Due to the natural conflict between natural language and coding language, it could take a significant amount of time to set up a smart contract.
- Understanding the use case is critical. Not all contracts should be turned into smart contracts and careful consideration must be made as to whether there is a need to create a smart contract. This scoping should be done upfront, before anything else. For example, many contracts intentionally contain an element of imprecision. Smart contracts on the other hand require obligations and triggers to be extremely precise. Codifying contracts or clauses that require a degree of discretion in execution could be costly for a party seeking to rely on that discretion.

Chapter 4: Interpretation of smart contracts

Question 23

Please share your views below::

The current principles of contract interpretation are unsuitable for application to the coded terms of a smart contract. Conceptually, the traditional exercise of contract interpretation has little relevance to the operation of coded contract. The principles governing the interpretation of contracts are well known. The objective is to identify the intention of the parties by reference to what a reasonable person having all the background knowledge which would have been available to the parties would have understood them to be using the language in the contract to mean. See for example the dicta of Lord Hoffman in Investors Compensation Scheme Ltd v West Bromwich Building Society [1998] 1 W.L.R. 96 and Chartbrook Limited v Persimmon Homes Limited [2009] AC 1101.
Further guidance is available per Lord Neuberger in Arnold v Britton at para 15: “That meaning has to be assessed in the light of (i) the natural and ordinary
meaning of the clause, (ii) any other relevant provisions of the [agreement], (iii) the overall purpose of the clause and the [agreement], (iv) the facts and
circumstances known or assumed by the parties at the time that the document was executed, and (v) commercial common sense, but (vi) disregarding subjective
evidence of any party’s intentions”.

The Supreme Court's characterisation of the interpretation process in Wood v Capita is also important: The process of interpreting a contract was described as being "a unitary exercise" which "involves an iterative process by which each suggested interpretation is checked against the provisions of the contract and its
commercial consequences are investigated.........Textualism and contextualism are not conflicting paradigms in a battle for exclusive occupation of the field of
contractual interpretation. Rather, the lawyer and the judge, when interpreting any contract, can use them as tools to ascertain the objective meaning of
the language which the parties have chosen to express their agreement.” (paras 12 and 13).

Contract interpretation also recognises that people make mistakes in their use of language. "It is a matter of constant experience that people can convey their
meaning unambiguously although they have used the wrong words. We start with an assumption that people will use words and grammar in a conventional way
but quite often it becomes obvious that, for one reason or another, they are not doing so and we adjust our interpretation of what they are saying accordingly … if
one meets an acquaintance and he says ‘And how is Mary?’ it may be obvious that he is referring to one’s wife, even if she is in fact called Jane. One may even,
to avoid embarrassment, answer ‘Very well, thank you’ without drawing attention to the mistake. The message has been unambiguously received and

The above extracts readily illustrate that contract interpretation involves evaluating a range of factors in order to form a view of the intention of the contracting
parties at the time the contract was entered into.

All of these principles appear to be redundant when interpreting the coded elements of smart contracts. The machine does not think and evaluate. It does not take
such steps to ascertain the intention of the parties. Rather, with coded contracts, the code will have a single meaning – it means what the code does when it is
executed.

Therefore, it is only natural language contracts or natural language elements of contracts that can be "interpreted".

Scenarios will however arise when one contracting party disagrees with the outcome of the machine’s execution of the code. From a conceptual standpoint, it
does not appear to be helpful to consider this as a matter of interpretation in relation to the coded contract. A potential solution may be to look to the remedy
skin to rectification where the contract, as executed, can be shown not to reflect the common intention of the parties. Reference is made to a remedy "akin" to
rectification because the concept of rectification will also likely have its conceptual limitations in relation to smart contracts. The coded contract itself could not be
physically altered by a court order. Rather, it would appear that a court would be required to order the creation of a new smart contract in order to achieve the
necessary outcome.

We do foresee challenges in applying the principles of interpretation to the terms of a smart contract where the terms may be in natural language, code, or both.

The principles of interpretation, having been developed in the context of natural language clauses, may be challenging to apply to code or a dual natural
language-code contract. Some of the difficulties arising from elements of the objective test concerning the intention of the parties have been illustrated through
the questions set out below.

Challenges may arise where:

- the code is not expressly incorporated in the contract. What would be the position on the code being impliedly incorporated into the contract? How would the
“business efficacy” test be assessed and applied? Could a smart contract be effective without corresponding code – would it simply cease to be smart or would it
not be a valid contract? Would it be so obvious as to go without saying that code should be incorporated with natural language in a smart contract? What then
would be the criteria for identifying a smart contract? Would a contradiction in one piece of code with one natural language provision prevent the whole code
being incorporated, or could it be severed and the balance incorporated?

- the code is incorporated into the contract, but the contract does not expressly state whether the natural language or code takes precedent. Where the two
components are in conflict, how would this be resolved? Would there be an implied presumption that natural language takes precedence? Or would there be a
presumption that whichever was drafted/written first takes precedence? Or would it depend on the familiarity of the parties with natural language and code
respectively (which could be objectively assessed) thereby indicating which better reflected the intention of the parties? What if one party is more familiar than the
other with code? What would be the position if one applied commercial common sense, but that only made sense in respect of the natural language but would be
technically/operationally ineffective in respect of the code?

- the code is incorporated into the contract, and the contract expressly provides that natural language clauses should take precedent. Would such a precedent
clause be legally effective? What formalities or mechanisms would be needed to make it effective? (Consider: RWE Npower Renewables Ltd v JN Bentley Ltd

To avoid some of the difficulties identified above, code should be formally integrated or incorporated into the contract to enable the enforceability of contractually
agreed mechanisms, overarching protections and liability relating to that code by the contracting parties. In particular, it is likely or would at least be prudent for
the parties to be allocating between them the liability arising from operational or technical failure of the smart/automated aspects of the contract.

Question 24

Please share your views below::

- Code is technical/operational so it works or doesn’t work – any “interpretation” is really a comment on its operational effectiveness and the automated outcome
generated. Interpretation may be necessary if there is a failure in the code, code has primacy, and one has to figure out what the code was intended to achieve –
e.g. was there meant to be this or that syntax which would have achieved X or Y outcome. If there had been primacy of natural language the necessary fix could
potentially have been determined that way, however if there was primacy of code expert evidence might need to be adduced to attest to the way coders typically
code to understand what the coding should have been, or would have been intended to have been, included by the coder. Expert evidence could be adduced to
identify whether code failure was in design or implementation of the code, whether code was properly written.

- Where there is a bug or fault in the code, but there is more than one potential fix where each fix would lead to a different outcome.

- Where some terms and phrases used in natural language may have an accepted legal sense through decided cases, this may not be so easily applicable as an
approach to interpretation in relation to code. Expert determination could be required to determine the meaning of specific coding.

- AI/self-learning code. This could lead to unforeseen outcomes that either one or all parties wish to dispute.

- Code produces binary outcomes, but was only designed taking account certain circumstances/parameters. Where unforeseen circumstances occur and the
operation of the code leads to perverse outcomes this could give rise to disputes.

- Where there is an automation/data sensor failure such that performance is not triggered – did the parties intend that this should lead to an automatic breach of
contract/event of default without alternative means of performance?
- Where the code is hacked or manipulated – how to prove the agreed version of the code, how to revert to agreed version of the code, how to unwind/resolve actions executed by the hacked or manipulated code.
- Where parties had the meaning/functionality of the code explained to them and they agreed to it, but it didn’t function as explained or they didn’t understand the explanation.

**Question 25**

Please share your views below:

**Question 26**

Please share your views below:

**Question 27**

Please share your views below:

**Question 28**

Please share your views below:

**Question 29**

Please share your views below:

**Question 30**

Please share your views below:

This question is similar in scope to Question 23. Please see response above.

**Chapter 6: Consumers and smart contracts**

**Question 43**

Please share your views below:

**Question 44**

Please share your views below:

**Question 45**

Please share your views below:

**Question 46**

Please share your views below:

There are some questions that we think need to be considered to inform this section.

**Who is the consumer?**
- Commercial/business clients
- Individuals/general public
- Different regimes and standards will apply, depending on the nature of the transaction, the sector and the geographic location
- What transactions would we intend to cover and of what value?

**Consumer rights – but under what jurisdiction?**
- In a cross-border set up, how would we ensure consistent compliance with our preferred standards of consumer regulation?
- Would the consumer be given the option to select his/her preferred jurisdiction?
- Thinking here about banking transactions – option to choose currency
- Would the host be responsible for ensuring compliance?
- How would we incentivise the use of smart contracts considering the potential regulatory burden?

**What about cyber security?**
- How do we ensure that the data of consumers is protected? While using blockchain might alleviate some of the concerns, it does not erase them completely.
- Security of the transaction will be one of the key factors in securing consumers’ trust in smart contracts and rolling them out on a larger scale.

**How to strike the balance between regulation and utility?**
- Smart contracts were designed to make it easier for consumers to transact without excessive formalities – how do we go about protecting the individual while
also minimising the state involvement/regulation?
- How do we build consumer trust in smart contracts with or without regulation?
- Consumers must understand the nature of a smart contract – perhaps increasing awareness would be a better approach than strict regulation?
- Regulated tools provide certainty of protection – so likely increase usage – but English consumer law could be useless in a global setup. This would need to be made clear to the consumer.
- What are our key concerns from the consumer’s perspective? Fraud?
- Would any other area of law cover our concerns? Contract law? Criminal law?
- Do we need to regulate under consumer protection or should we simply provide consumers with sufficient tools to assess the risk for themselves?
- Perhaps we could have a built-in ADR solution to assist with disputes without needing to over-regulate
- The consumer needs to have a recourse if things go wrong – but regulation might not be the best way to address this issue, especially if the regulator becomes overwhelmed with requests.
- How would a consumer be informed of the risk? Social campaigns?
- How do we minimise the need for professional advice in using smart contracts?
Thinking about T&Cs of online platforms – how many people actually read them? How many people are willing to accept them anyway?
- Consumer regs do not guarantee safety of a transaction – so advice would likely be required on other grounds.

Would the smart contract cover all stages of the transaction?
- Would the payment function be integrated in a single transaction?
- If so, more questions arise from the regulatory standpoint.
- If not, questions arise from the point of utility – the transaction risks overcomplication

Chapter 7: Jurisdiction and smart contracts

Question 47

Please share your views below:

Identifying the place of formation of smart contracts clearly poses significant difficulties – particularly where the contracts takes places entirely virtually. In the consultation document one suggestion is that the question could be answered by reference to the place where the node(s) running the program that makes/accepts the offer is/are situated. However, it is unclear, practically speaking how easy it would be for parties to identify the location of the nodes. What if the node has been physically moved or disconnected from the network after the relevant act took place – would it still be possible to locate the place it was at the relevant time?

Question 48

Please share your views below:

Question 49

Please share your views below:

Does Art 3(1) of the Rome I Regulation the rules of a of platform’s protocol to be given effect to as a choice of law?
We do not consider that the Rome I Regulation currently permits a platform protocol to constitute a choice of law in terms of the Regulation. The Rome I Regulation gives parties a freedom to choose the law applicable to their contract, however we agree that “law” for the purposes of the Rome I Regulation means a national legal system only. Reference is made to Article 22 of the Regulation which states:

"Article 22
States with more than one legal system
1. Where a State comprises several territorial units, each of which has its own rules of law in respect of contractual obligations, each territorial unit shall be considered as a country for the purposes of identifying the law applicable under this Regulation.
2. A Member State where different territorial units have their own rules of law in respect of contractual obligations shall not be required to apply this Regulation to conflicts solely between the laws of such units."

Article 22 clearly indicates that references to “applicable law” within the Rome I Regulation are references to national legal systems.
We note that the Rome I Regulation no longer applies on a reciprocal basis save in respect of contracts concluded on or before 31 December 2020.
Should Art 3(1) of the Rome I Regulation the rules of a of platform’s protocol to be given effect to as a choice of law?
With regards to the issue of whether a platform protocol should be permitted as a choice of law under Rome I, we consider that this presents some potential difficulties.

For example, Article 12 of the Regulation states:

"Article 12
Scope of the law applicable
1. The law applicable to a contract by virtue of this Regulation shall govern in particular:
   (a) interpretation;
   (b) performance;
   (c) within the limits of the powers conferred on the court by its procedural law, the consequences of a total or partial breach of obligations, including the assessment of damages in so far as it is governed by rules of law;
   (d) the various ways of extinguishing obligations, and prescription and limitation of actions;
   (e) the consequences of nullity of the contract.
2. In relation to the manner of performance and the steps to be taken in the event of defective performance, regard shall be had to the law of the country in which
The purpose of the Rome I Regulation is to allow parties to a contract to choose an applicable law and therefore, with limited exceptions, to exclude the application of any other law. Obviously, this is designed to give parties freedom to choose the applicable law, but also to create certainty and to avoid a “conflict of laws” scenario. In theory we see no reason why the definition of “applicable law” could not be changed to accommodate a choice of platform protocol. However, we do see some potential pitfalls with this.

It is unclear whether a platform protocol is capable of dealing with all such matters. However if we were to assume that it were so capable, what would happen if it did not? For example, a particular platform protocol may not deal with all the matters set out in Article 12. Say for example the platform protocol does not set out the time limit within which claims can be brought. Does that mean that claims under the relevant smart contracts are imprescriptible? What if it does deal with time limits but in a way that is ambiguous?

Perhaps it would be more appropriate to treat a particular set of platform protocol rules as akin to standard terms and conditions which have been incorporated into the contract? To the extent the rules deal with the matters noted at paragraphs (a) to (e) of Article 12 they would be applied by the courts in accordance with the existing principle of the freedom to contract as desired – but where there are ambiguities or lacunae in the rules, the general law would be applied to resolve any issues.

Question 50

Please share your views below:

Question 51

Please share your views below:

Think this requires at least some understanding of the actual DLT platforms – for example one suggestion is that it ought to be the location of the majority of the mining nodes

Question 52

The principle difficulty with smart contracts and applicable law is in establishing the identity of the parties, their location, and the location in which the contractual obligations are performed. However in the specified examples, these problems would seem to be more easily overcome than in, for example, a contract for the exchange of virtual currencies/tokens which take place in an automated fashion.

Contracts of Carriage

Contracts of the carriage of goods must involve physical goods being transported by a traditional carrier and being physically delivered from one location to another. There would not therefore appear to be any difficulty establishing the relevant jurisdiction for the purposes of paragraphs (a) to (e) of Article 5.

Consumer Contracts

The principle objective of Article 6 is to allow the consumer to benefit from the application of the law of the country of his or her domicile. As the consumer must necessarily be a natural person, the relevant law can always be determined.

However, from a practical perspective, if the consumer cannot identify the seller/service provider in order raise proceedings against them and/or cannot locate them in order to enforce a judgement, this runs the risk of undermining the extensive set of consumer protections currently in place. There may therefore be a question of public policy to be addressed as to whether smart contracts are appropriate for consumers

Insurance Contracts

As insurers must be regulated there should be no difficulty establishing its place of habitual residence. When it comes to establishing the place where the risk is situated and or the place of residence of the policy holder, the fact that the contract was a smart contract should have no impact on the existing regime.

Employment Contracts

As with consumer contracts, in theory at least, the fact that a contract of employment is a smart contract does not impact on the identification of the relevant jurisdiction given that the employee must be a natural person. However, Article 8 provides:

“An individual employment contract shall be governed by the law chosen by the parties in accordance with Article 3. Such a choice of law may not, however, have the result of depriving the employee of the protection afforded to him by provisions that cannot be derogated from by agreement under the law that, in the absence of choice, would have been applicable pursuant to paragraphs 2, 3 and 4 of this Article.”

If an employee performs services pursuant to a smart contract the difficulties in establishing the identity and/or location of the employer risks undermining the protections afforded to employees.

Question 53

Please share your views below:

Question 54

The most obvious connecting factor is the place of domicile of the legal or natural persons who are the ultimate contracting parties (subject to the potential difficulties in identifying them).

There is also a suggestion that the location of the nodes is relevant.

Question 55

Please share your views below:
Which, if any, rules for establishing jurisdiction do you consider will be most problematic in the smart contracts context? Do you agree with our analysis of the issues as described in this call for evidence?

We consider that the biggest issue will be identifying a relevant physical territory in which to found jurisdiction when a transaction takes place entirely virtually. Another issue will be establishing the identity and location of the contracting parties. While arguably this does not necessarily directly impact jurisdiction it is still relevant. Say, for example, jurisdiction in the context of a smart contract could be founded by reference to the location of the nodes and that allows parties to easily identify one relevant jurisdiction. However if the contract were a traditional contract, there will often be multiple potential grounds of jurisdiction (the domicile of the defendant, the place of characteristic performance, in some cases the domicile of the claimant). This allows the claimant to choose the most appropriate jurisdiction bearing in mind that a judgement is of little value to a person if it cannot be enforced against the defendant. Often therefore, a party will chose to litigate in the place where the defendant and/or its assets are located in order that any judgement can be enforced.
Response to the Law Commission’s Call for Evidence on Smart Contracts dated December 2020 (the “Call for Evidence”)

We are pleased to have the opportunity to contribute to the Law Commission’s work on smart contracts. We consider this to be a very worthwhile project and one which will make a significant contribution towards ensuring the jurisdiction of England and Wales remains a competitive choice of business. A great deal of work has clearly gone into the analysis, and we agree with the large majority of it. There are, however, a few areas where we question some of the views expressed and suggest additional and different perspectives. We outline those in this response.

The key conclusions are summarised below:

- Some of the parameters of the defined term “smart contracts” (and hence the proposed scope of the study) could benefit from further consideration. In particular, we have not found a clear justification for limiting the scope of the study to DLT-based automation, given that, among other things: (i) the use of DLT *per se* does not (in our view) give rise to unique legal issues; (ii) we have been advising on both DLT-based and non-DLT-based smart contract deployments; and (iii) restricting the scope of the study in this way may impede the Commission’s broadly framed objective of ensuring the jurisdiction of England and Wales remains a competitive choice for business.

- Although the use of smart contracts can, in some circumstances, give rise to unusual fact patterns that the courts will have to grapple with, in general we consider that existing principles of contract law are adequate and do not require fundamental amendment at this stage. In some cases, statutory requirements may need to be clarified.

- We agree with the conclusion in the UKJT Legal Statement¹ that the mere deployment of smart contract code will not give rise to a legally binding contract in the absence of extraneous evidence.

- In a number of circumstances (particularly in the context of decentralised multilateral arrangements), a lack of sufficient extraneous evidence will mean that the arrangements do not amount to a legal contract. Whilst this may raise policy concerns in some areas, we do not see this as a justification for any fundamental changes to contract law. Instead, we recommend considering other canons of law, including regulation, tort law, the laws of equity and/or criminal law, as appropriate in the circumstances. In addition, in some circumstances, there may be sufficient evidence to conclude that some form of collateral contract has been concluded between two or more parties.

- To the extent that gaps in the law are identified, we expect that in many cases the common law will be able to adapt as and when needed. Given the rapidly evolving nature of the smart contract industry, this is likely to be preferable to any attempt to pre-empt issues in advance.

¹ As defined in the Call for Evidence.
Our response is split into two parts. The first part sets out certain overarching themes whilst the second part addresses specific questions posed in the Call for Evidence.

1 Overarching issues

1.1 Defining smart contracts

The definition, and use of the defined term, “smart contracts” in the Call for Evidence could benefit from further consideration. Defining this term precisely and using it consistently is key to the success of the consultation, and any consequent proposals. At present, the term is used in an inconsistent and sometimes circular manner and includes some parameters that we query. We set out our thoughts below.

1.1.1 Legally binding contract

We note the intention to limit the Call for Evidence to smart contracts which constitute legal contracts.\(^2\) However, including the “legally binding contract” criterion within the definition of “smart contract” on page (ix) gives rise to various inconsistencies and circularities in the paper. For example, there are a number of references\(^3\) to smart contracts which imply a broader definition, and indeed a broader definition is set out in paragraph 1.1. In order to facilitate greater precision, it may be helpful to distinguish between smart legal contracts and smart contract code within the definitions section and use the terms consistently.

1.1.2 Solely code model

The Call for Evidence sets out three forms of “smart contract” (which, as noted above, is defined as a legally binding contract), the third of which is the “solely code contract”. These three forms are included within the definition of “smart contract” on page (ix). In our view, the mere deployment of executable computer code will never satisfy the requirements for the formation of a legally binding contract as described in paragraph 3.1 of the Call for Evidence (the “Requirements”) in the absence of extraneous factors, such as communications or conduct between the participants. Equally, extraneous evidence will be needed to interpret the terms of a legal contract. We believe this view is also consistent with the statements in the UKJT Legal Statement, which states: “Where the code itself will not assist is with the question of whether an agreement has been reached at all (as the mere existence of code capable of executing contractual promises reveals nothing about whether Alice and Bob actually agreed to contract on the basis of such code) and whether they intended to create legal relations. Those questions will need to be answered by reference to evidence extrinsic to the code itself.”\(^4\)

At a minimum, a person will need to interact with the code for any possibility of a contractual relationship to arise. That interaction is external to the code. Likewise, in order for the courts to determine that the parties intend for their agreement to be governed by executable code, there needs to evidence of this intention outside the code. In many circumstances (particularly in a multilateral context), further communications and conduct will also be

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\(^2\) As explained in paragraphs 2.30 and 2.31 of the Call for Evidence.

\(^3\) For example, in Chapter 3 in discussions around the ability of “smart contracts” to satisfy the requirements for a legally binding contract - e.g. see paragraphs 3.21, 3.30, 3.32, 3.35, 3.37, 3.39, 3.45 and 3.46 of the Call for Evidence.

\(^4\) UKJT Statement, at p.33, paragraph 145.
needed to meet the Requirement for certainty of terms, as discussed further in paragraph 1.2 below, and/or to determine or interpret the terms of the contract.

We note that it is possible to build into otherwise executable computer code written notes or other statements in natural language which are not themselves executable but are merely intended to reflect natural language communications between the parties. Whilst these terms can technically form part of the code, we would treat them as extraneous evidence for these purposes. Thus, references in this document to smart contract code are intended to refer to executable smart contract code, unless stated otherwise.

On this basis, we suggest that smart legal contracts can take only two forms. We broadly agree with the descriptions of those two forms as set out in paragraph 2.32(1) and (2) of the Call for Evidence. We would reiterate that the key distinction between those two models is whether the code forms part of the legal contract or not. In this respect, it may be more helpful to describe the two models as the “external model” (where the code does not form part of the legal contract) and the “internal model” (where it does). Legal contracts comprised solely of executable and non-executable code would fall under the internal model.

1.1.3 External vs internal model

It is important not to overlook the distinction between the external and internal models in the context of contractual analysis, for example in analysing the consequences of a coding error. If a coding error occurs in respect of an external smart contract, this will not affect the terms of the legal contract. The parties will still be bound to fulfil their contractual obligations according to the natural language contract. The risk therefore falls on the party that is seeking to fulfil its obligations through the deployment of smart contract code. In this respect, there is nothing novel about an external model smart contract from a legal perspective. If, on the other hand, an error is made in respect of code which constitutes part of a legal contract, the aggrieved party may have no separate legal obligation to fall back on, which does raise novel concerns.

In practice, however, it may not always be easy to determine whether a particular contract falls within the external model or the internal model, particularly where the parties have been silent or ambiguous on this point. The analysis could be complicated if, for example, the code has been “translated” into natural language for verification purposes, so that a natural language version of the code exists. In some cases, this may be done through an interface that allows the parties (or their lawyers) to check new code regularly. Parties would be well-advised to make clear by express agreement which version prevails (in the same way as they would with a contract that is translated into multiple natural languages). However, in many cases the intention may not be explicitly stated. The use of audit procedures, through which the potential outcomes of the code are simulated and checked, can also blur the distinction between internal and external model contracts in some respects. For example, an external model contract may be interpreted by reference to the audited outcomes of the code, as these outcomes constitute part of the background information available to the

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5 In the sense that the natural language notes are incorporated into otherwise executable code in a manner that ensures that the machine does not execute the notes themselves, for example because the code includes a command to skip those sections.

6 As per the ISDA whitepaper Smart Contracts and Distributed Ledger: A Legal Perspective, which you have referenced, available at https://www.isda.org/a/6EKDE/smart-contracts-and-distributed-ledger-a-legal-perspective.pdf.

7 As discussed in paragraph 2.35 of the Call for Evidence.
parties at the time of entering into the contract (and hence the understanding of the reasonable person).

In some cases, it may also be challenging to determine precisely what terms form part of an internal model contract (including to determine whether a legal contract has been formed). There will not always be a formal document that sits neatly alongside a piece of contract code. In some cases, the legal contract could include communications and/or conduct evidenced in a number of sources (as discussed further in paragraph 1.2 below). It will be for the courts to determine the objective intention of the parties - including whether the essential terms of the contract were agreed - by reference to the facts of the case.

1.1.4 Distributed ledger technology (DLT)

The Call for Evidence defines smart contracts by reference to DLT and proposes that the Law Commission’s study be limited to smart contracts which use DLT. Whilst we agree there are certain benefits to deploying smart contracts on distributed ledgers in some contexts, we do not consider that the use or absence of DLT in and of itself should alter the analysis in relation to contract formation and interpretation, for the reasons outlined in the following paragraphs. Moreover, we have recently been engaged in relation to certain matters involving the establishment of financial market infrastructure that utilises smart contracts, where some use DLT-based infrastructure and the others use a centralised ledger. We also understand that some smart contract programming languages like DAML (which you reference in the paper) are designed to work in respect of both DLT-based and non-DLT-based systems. In these circumstances, it would be unhelpful if this study were to distinguish between different types of smart contract based on underlying technology and to leave non-DLT-based smart contracts out of scope without a clear justification, based on the applicable legal analysis, for doing so.

The Call for Evidence assumes that “immutability” is a fundamental distinguishing feature of DLT as compared with centralised ledgers.\(^8\) In fact, this is not an intrinsic feature in all DLT applications. For example, some permissioned systems involve a central administrator operating a “master node” that has additional override or rectification powers in relation to the maintenance of the ledger.\(^9\) Even in a decentralised context, the immutability of the ledger is not necessarily absolute. Many decentralised networks are, for example, vulnerable to a “51% attack”, where participants conspire to take over the majority of the network’s computing power in order to manipulate consensus.\(^10\) Likewise, the Call for Evidence seems to assume that where smart contracts are deployed on centralised ledgers the computer program will necessarily be subject to the control of one or both of the contracting parties.\(^11\) However, smart contract code may equally be deployed on a ledger maintained by a trusted central party, with all contracting parties being denied the ability to manipulate the “golden version” of the contract code. For these reasons, we recommend against drawing a hard distinction between DLT-based and non-DLT-based systems based on the grounds of immutability. What may be of more relevance, particularly in relation to internal model contracts, is whether or not there is a golden version of the contract code which all parties agree to follow and/or whether any party to the agreement is able to amend

\(^8\) See, e.g. paragraphs 2.15 and 2.19 of the Call for Evidence.
\(^9\) As acknowledged in paragraphs 2.21 and 2.27 of the Call for Evidence.
\(^11\) See paragraph 2.24 of the Call for Evidence.
this unilaterally. However, even these distinctions may only be of relevance in certain contexts. We therefore recommend against including these parameters within the definition.

The Call for Evidence also distinguishes distributed ledgers from centralised ledgers on the grounds that the former removes the need for data reconciliation.\(^{12}\) We agree that reconciling data between multiple systems offers the potential for considerable efficiency gains. Some of these gains can be achieved through the use of application program interfaces (APIs), which enable copies of data to be passed easily between different systems, without the use of DLT. However, a distinguishing feature of DLT-based systems is that they enable an original instance of the golden version of the data and the embedded code to be run directly on each node. This may be a significant potential benefit in complex multilateral ecosystems such as financial markets, as it can facilitate end-to-end automation of transactions (including direct interaction with internal processes). Nonetheless, we are not confident that it justifies limiting the scope of the study to DLT-based smart contracts, when, as noted above, smart contracts are used more broadly, and we question whether there is any legal significance to this feature. It could be relevant in relation to certain issues (for example, evidentiary matters), but we expect those can be addressed on a case by case basis.

It may be the case that contract law can more easily accommodate smart contracts deployed in a centralised context (whether on a centralised ledger or a distributed ledger administered under the oversight of a central trusted party), as the parties in this context may rely less on the technology and be more inclined to ensure that the hallmarks of a legal contract are present. However, we do not see this as a reason to exclude them from the study. Novel issues in relation to contractual interpretation could be equally relevant in the context of centralised arrangements (particularly if they involve internal model smart contracts). Moreover, as outlined in paragraph 1.2.4 below, self-executing contracts have been used for many years in some areas (including in heavily regulated environments), and it would be unwise to treat the latest models as an entirely new beast. Likewise, a decision to exclude existing models from this study should be based on a sound justification. This may be driven by the purpose of the study, and whether the intention is to consider specifically whether DLT-based automation presents unique challenges to the application of existing contractual principles (in which case, we would argue that the answer is likely to be no, although the use of DLT may give rise to an unusual set of facts that the courts will have to grapple with) or instead to attempt to identify those aspects of smart contracts that present the greatest challenges, regardless of the underlying technology. The stated goal of ensuring the jurisdiction of England and Wales remains a competitive choice for business\(^{13}\) suggests it is more likely to be the latter.

As a general point, we would also flag that the Call for Evidence oversimplifies the distinction between permissionless and permissioned systems. It defines the former as “a DLT system in which nodes do not need permission from any entity to participate in the network” and the latter as “a DLT system in which nodes cannot participate until they receive permission from a central administrator”.\(^{14}\) There are, however, various degrees of permissioning to consider.\(^{15}\) Some permissioned systems may simply require participants to satisfy certain

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\(^{12}\) See paragraph 2.19(3) of the Call for Evidence.

\(^{13}\) See paragraph 1.5 of the Call for Evidence.

\(^{14}\) See page (viii) of the Call for Evidence.

\(^{15}\) As briefly alluded to in paragraph 2.28 of the Call for Evidence.
criteria in order to gain access (for example, “know-your-customer” type requirements). In other systems, participants may be required to sign up to some form of overriding rulebook or legal framework which sets out the terms on which the system operates. Where such framework exists, its rules may often form part of legal contracts established between interacting participants. Under some (but not all) of these systems the participants may also agree to give certain powers to a central administrator acting through one or more master nodes, as referred to above. Permissioning may also exist at either the network level or the smart contract level or both. For example, a participant may require permission from a platform operator to interact with a smart contract which has been deployed on a permissionless network (such as Ethereum). These precise distinctions may have important implications in relation to the contractual analysis in some cases.

Other related definitions could also benefit from further consideration. For example, the definition of “token” states that a “token typically does not have intrinsic value but is linked to an underlying asset of value”.16 We would flag that in many cases a token will not be linked to any separate asset of value; in some cases, the asset or token in question will comprise solely the set of arrangements that give rise to the ability to spend (i.e. render inert) certain data, to the exclusion of another party.17 This can be the case even if the token is algorithmically linked to the value of a particular asset (such as a fiat currency). Likewise, a token may have value because it is the only type of digital asset that may interact with a particular smart contract to produce a particular result and this functionality (which may be embedded in the smart contract and not the token) may confer value on the token. This is the case, for example, for certain “staking” tokens, which have a technical (though nonetheless potentially valuable) function in the context of the operation of a specific protocol. This definition and others will also need to be reconsidered carefully if the Law Commission does decide to take a more technology-neutral approach as we suggest.

1.1.5 Automaticity

The Call for Evidence acknowledges in paragraph 2.6 that a distinctive feature of smart contracts compared to traditional contracts is that some or all of the contractual obligations are performed automatically by computer programs, without the need for human intervention. We would tend to agree with that. However, this is inconsistent with the definition of “smart contracts” set out on page (ix), which refers to “a legally binding contract in which some or all of the terms are recorded in or performed automatically…” (our emphasis). We would suggest deletion of the italicised words.

1.2 Smart contracts in multilateral arrangements

In considering the Requirements, the Call for Evidence raises various examples to illustrate the possibility of their being met in a solely code model. However, in doing so it tends to overlook the complexities inherent in many of the scenarios identified, which in practice often involve multilateral arrangements. In our experience, whilst the contractual analysis is highly fact specific, many of the Requirements are often missing in certain multilateral contexts, unless the parties have taken specific efforts to establish them (for example, by creating a multilateral rulebook), as we discuss in the following paragraphs.

1.2.1 Identifying a counterparty

16 See page (ix) of the Call for Evidence.
17 See UKJT Legal Statement (as defined in the Call for Evidence), at paragraph 65.
The worked examples in the Call for Evidence regarding the formation and interpretation of contracts based on the conduct of parties through a distributed ledger assume that there are two clearly identified parties (Alice and Bob) and that one of them deploys and runs the smart contract code (representing an offer) and the other interacts with it (representing acceptance), in each case either directly or through computer programs. These examples are of course helpful to illustrate specific points.

Nevertheless, in practice, many smart contract arrangements (which, in this context, may or may not constitute or evidence smart legal contracts) involve complex multilateral structures. Different participants may be involved in programming the code, deploying it, running it and/or marketing it. The code may be run by a pool of validator nodes whilst the platform on which it is run is governed by a separate pool of governance nodes. There may also be other capacities in which “people” (and here, we use the term in the broadest possible sense to include entities that do not have legal personality as well as automated smart contracts) may participate, such as the right to vote on governance matters conferred by governance tokens. In the context of public blockchains, the operators of nodes are generally under no legal obligation to continue to perform their roles and holders of governance tokens may transfer them, so that those who exercise governance rights to make decisions that bind participants may cease to be involved in the arrangements, whilst their decisions may have an enduring impact upon the arrangements that changes the nature of those arrangements, with no ongoing participant having any responsibility for those decisions. Likewise, marketing materials (including explanations as to how the code and the platform operate or are intended to operate) may be written and edited by a community of voluntary contributors that varies over time and may express views or opinions that other participants disagree with. Some participants may perform multiple roles whereas others may participate in a single capacity. There may be no single view amongst participants as to what the arrangements achieve as a commercial matter, even though the outcome of the code may result in a clearly determinable outcome.

Whilst it is well accepted under English law that legal contracts may arise between participants in multilateral structures which do not fit neatly into the traditional offer-acceptance framework, that is generally only possible where the participants have in some way agreed to be bound by a set of common rules which govern the arrangement. In the majority of commercial arrangements, we would expect such common rules or terms to exist, as discussed in paragraph 1.2.4 below. However, in the absence of any agreement among the participants in relation to their roles and responsibilities, it can be difficult to conclude that there is any party against whom a person who interacts with the code may have a contractual right. In such circumstances, it can be challenging to find satisfaction of the Requirements, being, as they are, based on the premise that there is in fact a counterparty that has agreed to the identified terms of a legal contract and against whom identified contractual obligations can be enforced.

### 1.2.2 Terms of agreement

The Call for Evidence also assumes that provided the code is expressed with correct syntax and contains “all essential instructions” it will generally provide for a certain and complete agreement as to the terms of the contract. As discussed in paragraph 1.1.2 above, we do not consider it possible for a legal contract to be comprised of code alone in any
circumstances. In the context of some multilateral arrangements, there is often a significant lack of clarity within the code as to what the participants could be found to have agreed to and, in these circumstances, a significant amount of extraneous evidence is needed to identify the agreed terms of the contract.

Consider, for example, smart contract code which (in simplified terms) will, upon receipt of an amount of Ether, trigger an amount of a fiat-currency-linked stablecoin (typically, one which is created digitally and provides no express claim against any issuer or proprietary rights in any asset) to be generated into a digital wallet which the user is able to access, subject to the controls imposed by another piece of smart contract code run through the platform; the locked Ether (less fees) will be released back to the user in exchange for “burning” the relevant stablecoin. Legally, analysing only the code, this type of arrangement could potentially be characterised in a number of different ways. It could, for example, be characterised as a secured loan, an outright transfer of an asset, a barter, a sale and purchase or a repo. Indeed, it may not be characterised as a proprietary arrangement at all, but instead an agreement to provide the service of running the relevant code. The platform (or a community of participants) may ascribe a descriptive tag to the arrangement, but that description may or may not be determinative of the legal character in the absence of clarity as to the parties’ intentions. The legal character of the arrangement has meaningful implications in relation to the rights and remedies of the parties and in determining whether, and if so what, formalities need to be complied with.

This situation can be contrasted with the case of a vending machine. As the Call for Evidence sets out, it is established law that a person who puts a coin into a vending machine accepts an offer by the owner of the product being sold through the machine to sell the product, thereby forming a contract of sale. The act of inserting a coin into the machine constitutes evidence of an offer and acceptance, consideration and an intention to create legal relations. In these circumstances, the court will strive to find certainty of terms, by including in the contract only those terms that the parties can be objectively determined to have agreed to. In this case it is, however, very clear what the essential terms of the agreement are (i.e. an agreement in relation to the sale of goods). They could not be interpreted in any alternative way. This is typically not the case in relation to decentralised multilateral arrangements.

Where terms that are generally considered fundamental to a particular type of contract are missing, notwithstanding that the parties have agreed on matters of principle, courts have concluded that there is no legally enforceable contract. Additionally, if the material terms are too vague or uncertain, such that no definite meaning can be given to them, this would render the agreement incapable of constituting a legal contract (although strict legal precision is not a requirement). In other words, if it is legally or practically impossible to determine the content of the parties’ agreement or consensus, a contract cannot be formed.

### 1.2.3 Presumption of intention to create legal relations

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19 Chitty on Contracts (n 12), at paragraphs 2-120 and 2-121.

20 For instance, where many kinds of agreements on widely different terms could conceivably arise in that context, a “hire-purchase” agreement which lacked clarity as to the specific terms was deemed incapable of constituting a contract. See G. Scammell & Nephew Ltd v Ouston [1941] AC 251.

As you have identified\textsuperscript{22}, there is, typically, a strong presumption in the case of commercial transactions, where there is evidence of the parties achieving a consensus, that parties intended to create legal relations in the form of a legal contract. This burden is, however, reversed where there is no clear evidence of consensus between the parties and the claimant is seeking to rely on an implied contract that is inferred from conduct.\textsuperscript{23} Further, in some circumstances it may be questionable whether the relevant arrangements could qualify as “commercial” ones, particularly where they are available to consumers.

As outlined in paragraph 1.1.2 above, the UKJT Legal Statement notes that whilst pure code may, in theory, be capable of resulting in contractual promise, whether parties intended to create legal relations falls to be considered from evidence that is extrinsic to the code, through their words or conduct.\textsuperscript{24} It also acknowledges the existence of systems where “rules governing dealings are established by the informal consensus of participants, rather than by contract or in some other legally binding way. Consensus rules (employing methods such as proof-of-work or proof-of-stake) may also determine which version of the distributed ledger is definitive. The rules are self-enforcing in practice, even if not enforceable in law, because only transactions made in compliance with them and duly entered in the ledger will be accepted by participants as valid.”\textsuperscript{25} This appears to raise a presumption (albeit rebuttable) against construing pure code and interactions with the code as constitutive of a legal contract, without other extrinsic evidence to demonstrate the parties’ intention to form such a contract.

\subsection*{1.2.4 Multilateral rulebooks}

For most multilateral arrangements we would therefore expect that a significant amount of extraneous evidence will be needed to establish that the Requirements have been met and determine the terms of the contract. Often, there will be a number of factors outside the code that the courts can look to for these purposes. This will include marketing materials (such as whitepapers and explanations on websites), the conduct of the parties and any non-executable terms of the smart contract code. However, in many cases, this evidence alone will not be sufficient to meet the Requirements given the complexity of the arrangements and the possibility of multiple different interpretations. Achieving the requisite level of clarity would likely require the presence of detailed rulebooks or legal frameworks which are agreed to by all the participants. Where such rulebooks are lacking in an arrangement we note that it may be extremely difficult to conclude that the Requirements have been satisfied.

In commercial multilateral smart contract arrangements where the participants do intend to create legal relations, such rulebooks do typically exist and are often very well written as a result of the considerable investment in resources allocated to them. Commonly occurring and high value examples arise in the context of trading, clearing, custody and settlement venues and collateral management systems (in respect of both traditional financial instruments and cryptoassets). One may not typically associate such venues or systems with smart contracts, but smart contracts can and do arise in these contexts. To take one example, we view financial market trading contract arrangements as a classic case of multilateral, internal model, smart legal contracts. Within the framework of a multilateral

\begin{itemize}
\item \textsuperscript{22} See paragraphs 3.37 and 3.38 of the Call for Evidence.
\item \textsuperscript{23} As you have acknowledged in paragraph 2.48 of the Call for Evidence. See also Chitty on Contracts (33rd ed., 2019, Sweet & Maxwell), at paragraph 2-170.
\item \textsuperscript{24} UKJT Statement, at p.33, paragraph 145.
\item \textsuperscript{25} UKJT Statement, at p.10, paragraph 29.
\end{itemize}
contract to which all participants trading on a trading venue subscribe, the participants interact with smart code by inputting instructions for the formation of numerous individual bilateral contracts. Under that multilateral contract, there is often no natural language wording which details how the algorithmic routing of trades will operate (and, indeed, there is generally a prose term of that contract that will specify that the outcome of the underlying code will prevail), and yet the parties are bound by the outcomes of the algorithms embedded in the code.

In many cases, the algorithmic code is not subject to the control of the parties to each contract that is concluded under the rules, although this is not always the case, for example if the trading platform is a party. As an aside, one needs to refer closely to the rulebook to determine the parties to each individual contract concluded by the algorithm, as this is not a forgone conclusion – for example, different rules for different trading venues provide that the contract is concluded between: (i) two participants inputting instructions that are matched; (ii) each such participant and the trading venue (so those participants contract with the trading venue and not each other); (iii) one or more members of the venue in place of a participant (which would contract as agent of the member); or (iv) each participant and a nominated central counterparty that is not the trading venue. This potential complexity further demonstrates the necessity for rules that clarify the arrangements. A detailed exposé of the multiple ways in which such smart contracts may operate is set out in the bestselling book Flash Boys by Michael Lewis. This example also illustrates that smart contracts are not a novel concept and are capable of use in a heavily regulated environment. In addition, we note that in the world of regulated exchanges and other trading venues such smart contracts are not deployed on DLT.

We have also advised on the use of rulebooks in the context of new digital market infrastructure platforms designed to facilitate the end-to-end automation of financial transactions. This includes platforms based on centralised infrastructure and on DLT - as noted in paragraph 1.1.4 above, the use of DLT does not preclude the use of rulebooks to which the participants must subscribe.

Finally, it is worth noting that rulebooks can also be used where the parties do not intend to create legal relations. For example, in virtual video games there is typically a set of user terms which specifically disclaim any intention to create legal relations in relation to online environments created by their software.

1.2.5 Limits of contract law

The analysis above should illustrate that there may be a number of novel arrangements involving smart contract code which do not give rise to legal contracts. Our view is that contract law should not be contorted significantly to address any policy concerns in this area. Whilst there are edge cases where the courts have taken a broad view to find a contract where satisfaction of one of the Requirements is in doubt, this has typically been in circumstances where all the other Requirements were clearly satisfied.

For example, in Carlill v Carbonic Smoke Ball Co, where the court made an exception to the rule that acceptance must be notified to the offeree, this was in circumstances where it was able to satisfy itself that all the other elements were clearly present (including an explicit
offer, clear terms and specific action to evidence intention to create legal relations) and that
the offeror had shown that it did not expect notice of acceptance, apart from notice of the
performance. Similarly, in Clarke v Earl of Dunraven28, where the court was able to find a
contract despite the lack of a traditional offer and acceptance framework, this was in
circumstances where the parties had each agreed to a detailed set of rules which evidenced
clearly an intention to create legal relations and the terms of the agreement. Likewise, in
RTS Flexible Systems Limited v Molkerei Alois Muller GmbH29, the court was able to find an
intention to create legal relations despite the “subject to contract” clause in the letter of intent
not just because performance had started but also because the essential terms of the
contract had already been agreed. The test applied turned on whether the parties had
agreed upon all the terms which either they objectively regarded, or the law required, as
essential for the formation of legally binding relations.

In our view, it would be undesirable to extrapolate individual edge cases that consider a
potential failure to satisfy one Requirement to find a contract in circumstances where almost
all the Requirements do not appear to have been satisfied. Instead, we recommend
considering other cannons of law to address policy concerns and protect individuals in these
circumstances, including regulation (which may need to evolve), tort law, the laws of equity
(for example, in relation to unjust enrichment) and/or criminal law, as appropriate in the
circumstances. In addition, although it may not be possible to conclude with confidence that
a set of multilateral arrangements constitutes a contract, there may be sufficient evidence
to conclude that some form of collateral contract may have been concluded between two or
more parties.30

2 Response to Call for Evidence questions

2.1 Question 1. What kinds of contractual obligations can currently be automated using
computer programs? Please provide specific examples where possible.

Contracts that are heavily data-driven and which do not require frequent bespoke negotiation (for
example, those which are highly standardised or which constitute long-lasting framework
agreements) often lend themselves well to automation. It is also important that there is a single
golden source of data that the parties are willing to be bound by. A number of contractual obligations
in financial markets can meet these criteria, and we discuss some examples of financial market
applications in paragraph 1.2.4 above. Contractual arrangements that already define trigger events
by reference to objective quantitative criteria, and which incorporate fallback mechanisms, are
typically better suited to automation in the short term than others.

The parties also need to be able to rely on the integrity of the smart contract code. They may be
able to do this based on the underlying technology (e.g. use of DLT, though examples of DLT
deployments in the financial markets are currently limited) or the involvement of trusted central
parties, as discussed in paragraph 1.1.4 above.

2.2 Question 2. Do you agree that the Law Commission’s scoping study on smart contracts
should be limited to contracts which use distributed ledger technology? If not, please

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28 [1897] AC 59
29 [2010] UKSC 14
30 See, for example, Esso Petroleum v Mardon [1976] QB 801.
provide details of other technologies which are used to support smart contracts, and their prevalence.

We do not agree with this, for the reasons outlined in paragraph 1.1.4 above.

2.3 **Question 3. When, and why, do parties to smart contracts decide to use: (1) permissioned DLT systems; and (2) permissionless DLT systems.**

As outlined in paragraph 1.1.4 above, there is not a binary distinction between permissioned and permissionless systems, but rather various degrees and types of permissioning to consider. Parties may, for example, use permissioned access to address regulatory requirements, including in relation to “know-your-customer” obligations or investor qualifications. Parties may also use permissioning in order to establish, or equally to disclaim, legally binding rights and obligations between the participants, as discussed in paragraph 1.2.4 above.

2.4 **Question 4. Which of the three forms of smart contract discussed in para 2.32 of the call for evidence are most commonly used in existing smart contracts or smart contracts which are in development? Please provide examples of how these forms of smart contract have been used in practice.**

As outlined in paragraph 1.1.2 above, in our view the “solely code model” will not in any circumstances amount to a legal contract.

Using our terminology set out in paragraph 1.1.2, external model smart contracts are currently much more prevalent than internal model smart contracts. External model smart contracts (in a broad sense) have been used for many years in financial markets, for example to automate margining processes or interest payments. In these historic use cases, the contract code has often remained under the control of one party (i.e. the party that is deploying the code in order to meet its obligations). There has also been historic use of internal model smart contracts within financial markets, for example in the context of trading venues, as discussed in paragraph 1.2.4 above, though this is less common.

In relation to novel applications which are based on there being a golden source of code (established either through the use of DLT or designation by a trusted central party), the use of external model and internal model contracts varies, depending on the circumstances. As noted in paragraph 1.1.3 above, the decision to opt for an internal model contract over an external model contract changes the risk allocation, so this is a commercial decision. As also outlined in that section, in practice, the lines between the two models may be blurred for some purposes, for example where verification and/or audit processes are carried out.

2.5 **Question 5. How do code and natural language interact in hybrid smart contracts currently in existence or in development and which terms are generally coded?**

This varies significantly depending on the circumstances, including the sophistication of the parties and the values at stake. In some cases, there may be no formal documentation and the legal contract (if any) will comprise smart contract code together with extraneous evidence which speaks to the parties’ intentions and the terms of the contract. That extraneous evidence may be built into the smart contract code alongside the executable code or it may derive from a variety of other sources. In the latter case, there may be significant room for dispute as to how the code is intended to interact with other terms (and often this may mean that there is no consensus as to the essential terms of the contract and no contract has been formed). In other cases, there will be a formal
document, which has been specifically designed to sit alongside the code, and makes clear how the two are intended to interact.

2.6 Question 6. What process do the parties follow (or plan to follow) in negotiating, drafting and entering into a smart contract? Please explain in particular: (1) where all the contractual obligations are contained in a natural language agreement and the code is intended merely to perform those obligations, the practical steps involved in coding the parties’ rights and obligations contained in the natural language agreement; (2) where the parties intend that there will be a hybrid contract or a solely code contract, the practical steps involved in drafting, negotiating and agreeing the code of the smart contract; (3) where there is a hybrid contract, whether the natural language element and the coded element are entered into contemporaneously or at different times; and (4) the role played by third party service providers (such as computer coders and software firms) in this process.

Again, this varies significantly depending on the circumstances, including the sophistication of the parties and the values at stake. We would note the following points, however:

- In multilateral arrangements, there is often no linear negotiation process as contemplated in the question. Depending on the nature of the arrangement, the participants may or may not be required to subscribe to multilateral rulebooks which outline the terms of the arrangement, as discussed in paragraph 1.2.4 above. These rulebooks may be designed by the platform operator and/or other participants, depending on the circumstances.

- In commercial arrangements, the parties will often use verification processes to check the meaning of the code and/or audit procedures to simulate the code and check potential outcomes, as discussed in paragraph 1.1.3 above. Verification processes may in some cases involve creating an interface that allows the parties (or their lawyers) to check new code regularly. Sometimes these types of procedures will be carried out by third party service providers.

- As discussed in paragraph 1.1.3 above, whether the contract falls under the internal model or the external model will have a bearing on which party is at risk. This will have implications for how any code-checking processes are conducted in practice. In the case of a number of centralised systems, the participants may rely on a trusted third party such as the system operator to develop smart contracts that achieve a particular outcome. In the case of an external model, the third party is then at risk if the smart contract does not achieve the agreed outcome. In the case of an internal model, the participants may be at risk if they have agreed that the smart contract will take effect as coded and there is no collateral contract or representation that may override such agreement. In the cases of trusted third parties, there may be less rigorous independent testing of the code.

2.7 Question 7. Are you aware of any examples of use cases for smart contracts beyond those we give in the call for evidence, or variations on the use cases we give, which are being developed, are at proof of concept stage or are already operational? If so, please explain: (1) the technology used to create the smart contract; (2) the role played (if any) by oracles in the performance of the smart contract; (3) the contractual terms (if any) performed automatically by computer programs; and (4) whether the smart contract is a business to business commercial contract, a peer to peer contract or a business to consumer contract.

As outlined above, smart contracts may be used in respect of a wide range of financial products in the regulated markets, including loans, securities, repos and stock loans - not just derivatives, as
highlighted in the Call for Evidence. Smart contracts may be used to facilitate trading, clearing and settlement (for example, by automating delivery-versus-payment processes). They can also be used in the servicing of financial contracts, for example in relation to interest payments, or in collateral management. Such smart contracts may rely on both DLT and non-DLT technology. They may take feeds from oracles such as financial information vendors. We have restricted our commentary to financial markets contracts, but we understand that there are analogous smart contracts in many different sectors, such as online marketplaces, online gaming and insurance. See also paragraphs 1.2.4 and 2.1 above.

2.8 Question 8. What benefits and cost savings can smart contracts provide compared with traditional contracts? Will increased use of smart contracts lead to any additional costs? Please provide details and any available qualitative and quantitative evidence.

Smart contracts offer several potential benefits, particularly in relation to increased efficiency, as you have highlighted in the Call for Evidence.

As discussed in paragraph 2.1 above, some contracts are more suitable for automation than others. As well as the issues outlined in paragraph 2.1, we would flag that the automation of value movements can give rise to certain restraints which may not be consistent with commercial objectives in all situations. For example, for a value movement to occur automatically upon the relevant trigger, the value may need to be “locked” in a way that restricts it from being used for other purposes. This feature may be better suited to some arrangements (for example, collateral arrangements where use is intended to be restricted) than others (for example, arrangements where the ability to use the locked assets is central to the commercial agreement).

Likewise, it may not be feasible in many scenarios to program all the potential outcomes, and doing so may be prohibitively costly – as noted in paragraph 2.1, contractual arrangements that already define trigger events by reference to objective quantitative criteria, and which incorporate fallback mechanisms, are typically better suited to automation in the short term than others.

2.9 Question 9. In what ways can parties reach an agreement through their interactions on a distributed ledger?

See paragraphs 1.2 and 2.6 above.

2.10 Question 10. Are you aware of programming languages which are specifically designed to enable parties to reach agreement on a distributed ledger? If possible, please give examples of the circumstances in which they could be or have been used.

We are aware of DAML, which you have already identified, as well as the CSL Language.\(^{31}\)

2.11 Question 11. Do you consider that offer and acceptance can occur through the operation of autonomous computer programs deployed by the parties on a distributed ledger? If so: (1) in what circumstances? (2) on what legal basis?

Yes, we consider this to be possible in principle, based on the case law you have identified. Indeed, it may be straightforward to conclude that when two participants on an organised, but decentralised, trading venue agree to exchange two tokens on that exchange, where the exchange holds itself out as facilitating agreements between participants for the sale between each other of tokens, that the

\(^{31}\) See Transforming Commercial Contracts through Computable Contracting by John Cummins and Christopher Clack, available at <https://www.researchgate.net/publication/340114812_Transforming_Commercial_Contracts_through_Computable_Contracting>, at p. 6, Section B.
participants did, in fact, intend to create legal relations. Much will, however, depend upon the extent
to which there is clear evidence in materials published by the exchange as to the basis on which
participants interact with each other.

However, as discussed in paragraph 1.2.41.2 above, in practice it will often not be possible to
determine that the Requirements have been satisfied in more complex multilateral arrangements,
in the absence of clear evidence (such as the use of multilateral rulebooks). As noted in paragraph
1.1.2, we do not agree that two or more participants that deploy smart contracts on a DLT which
interact with other participants and/or other smart contracts necessarily intend to enter into legal
contracts with each other merely by reason of deploying those smart contracts, in the absence of
some evidence to the effect that the participants do intend to enter into legal contracts.

2.12 Question 12. How common is it for parties to enter into smart contracts on a DLT system
without knowing each other’s real identities and in what circumstances is this likely to arise?

In many multilateral arrangements it is quite common for the participants to engage in respect of
smart contract code without knowing the identities of one another. However, for the reasons outlined
in paragraph 1.2 above, many DLT-based multilateral arrangements (which are typically
decentralised arrangements) often do not give rise to legal contracts.

This is not a novel issue though, and legal contracts often arise in other contexts between
pseudonymous parties, including outside DLT-based environments. For example, whilst there are
different models, it is not uncommon for participants in traditional financial markets trading venues
and exchanges to be unaware of the identity of the person they are contracting with. Legal contracts
are capable of being formed in these circumstances in part due to the presence of multilateral
rulebooks and the possibility of identifying the parties if needed for enforcement purposes.

2.13 Question 13. What evidence might be available to a court to establish the identity of the
parties to a smart contract entered into pseudonymously on a DLT system?

In some circumstances, particularly in a DeFi context, it may be challenging to find evidence of the
parties’ identities. However, the less evidence there is in relation to the parties’ identities, the more
likely that there is no legal contract. If the parties do intend to create legal relations (and legally
enforceable remedies) there typically needs to be some means of identifying who the parties are for
enforcement purposes. Without this it would be difficult to conclude that they intended to create legal
relations. This does not in any way contradict the principle that legal contracts are capable of arising
between pseudonymous parties, which we agree with. See also paragraph 1.2 above.

As to what evidence might be available, regulated exchanges (in the UK, at least) will typically have
had to identify the participants in order to comply with anti-money laundering legislation, and thus
should be in possession of the evidence that links legal persons to public addresses. Similarly, if the
participants have subscribed to multilateral rulebooks, their identities should be traceable.

2.14 Question 14. Are you aware of, or do you foresee, any difficulties in applying the law on
consideration to smart contracts? If possible, please provide examples.

Not in principle. However, as discussed in paragraph 1.2 above, often it will not be possible to
determine that the Requirements have been satisfied in complex multilateral arrangements, in the
absence of clear evidence (such as the use of multilateral rulebooks).

2.15 Question 15. Are you aware of, or do you foresee, any difficulties in determining whether the
parties to a smart contract have reached a certain and complete agreement? If possible,
please provide examples.
Not in principle. However, as discussed in paragraph 1.2 above, often it will not be possible to determine that the Requirements have been satisfied in complex multilateral arrangements, in the absence of clear evidence (such as the use of multilateral rulebooks).

2.16 **Question 16. Are you aware of any instances where the parties to a smart contract have expressly agreed that they do not intend to create legal relations?**

Yes, we have advised clients that have not wanted their code to amount to a legal contract to disclaim any intention to create legal relations. In the case of code only smart contracts, this has included a recommendation to include in smart contract code written statements to that effect which are not executable – see paragraph 1.1.2 above.

2.17 **Question 17. Do you foresee any difficulties in ascertaining whether parties intend to create legal relations when they transact with one another on a distributed ledger?**

As discussed in paragraphs 1.1 and 1.2 above, there are means by which the parties can make clear their intention to create legal relations when transacting on a distributed ledger. This includes the incorporation of natural language wording into the smart contract code or the use of detailed legal frameworks or rulebooks for participants to subscribe to. In the absence of such evidence, it may often be the case that the parties did not intend to create legal relations, as discussed in paragraph 1.2 above (see, in particular, paragraph 1.2.3). As noted in paragraph 1.1.2, we believe that this view is supported by the UKJT Legal Statement.

2.18 **Question 18. Do you consider that source code could meet the definition of “writing” in the Interpretation Act 1978?**

We do not have a strong view, but if there is any doubt then it would be helpful to clarify this in statute to ensure legal certainty.

2.19 **Question 19. Do you consider that parties can “sign” an agreement recorded solely in code? If so: (1) are you aware of technologies that are currently in use or under development to facilitate the signing of agreements recorded solely in code? (2) please provide any examples from your experience of where the parties have signed an agreement recorded solely in code.**

Yes, in principle, provided that the parties have evidenced an intention to authenticate the document. If, however, there is any doubt, it would be helpful to clarify this in statute to ensure legal certainty.

We would flag that practical difficulties may arise in practice. For example, in some cases it may not be clear that a cryptographically authenticated execution does evidence an intention to authenticate, particularly if the parties are not tech-literate. Likewise, if the execution is performed by a purported agent on behalf of one of the parties, there may be challenges in demonstrating authority to sign in the absence of an explicit agreement. See also the discussion on consensus arrangements as an alternative to legal contract arrangements in paragraph 1.2 above.

2.20 **Question 20. Do you think that smart contracts using DLT are currently able to utilise eIDAS compliant advanced electronic signatures and qualified electronic signatures? If not, how do you think they could be designed to accommodate these types of signatures?**

No comments.

2.21 **Question 21. Are you aware of any cases in which parties have arranged for the terms of a deed to be performed by, or recorded in, computer code deployed on a distributed ledger?**
2.22 **Question 22.** Do you consider that a deed recorded partly or wholly in code can satisfy the statutory formality requirements applicable to deeds and address the implications of the Mercury decision?

It would be helpful to clarify this in statute to ensure legal certainty.

2.23 **Question 23.** Are you aware of, or do you foresee, any difficulties in applying the principles of interpretation to identify whether terms of a particular smart contract are contained in the natural language component or the coded component of the smart contract, or both?

As discussed in paragraphs 1.1.3 and 1.2 above, there can be various complexities in determining whether a contract has been formed and what its terms are. Notably:

- smart contract code can never amount to a legal contract in the absence of extraneous evidence;
- it is not always clear cut whether a contract follows the internal model or external model and thus what the role of the code is in the legal contract;
- verification and audit processes may be relevant in determining what background knowledge was available to the parties at the time the contract was made; and
- contractual terms may be reflected in a variety of sources, including marketing materials, explanations on a website, non-executable statements in contract code and the conduct of the parties.

If there is a lack of consensus as to the essential terms of the contract, which may often be the case in respect of decentralised multilateral arrangements, then no legal contract will be formed.

2.24 **Question 24.** In what circumstances might disputes arise about the proper interpretation of the coded terms of a smart contract? Please provide examples where possible.

We agree with the examples you set out in paragraph 4.13 of the Call for Evidence. Disputes are likely to arise in a scenario where elements of the smart contract code conflict with other terms explicitly or implicitly agreed between the parties or are otherwise inconsistent with the subjective intentions of one of the parties.

2.25 **Question 25.** Do you consider that the meaning of a coded term of a smart contract would or should be determined by asking what the term would mean to a: (1) reasonable person; (2) reasonable person with knowledge of the relevant code; or (3) functioning computer?

Given the factors outlined in paragraph 2.23, a piece of smart contract code can never be interpreted in a vacuum but instead must be considered in the context of the wider agreement.

If the court has concluded that a coded term does form part of the legal contract, then in our view it should ask what the term would mean to a reasonable person with an understanding (i.e. more than mere knowledge) of the relevant code. This position is akin to interpreting a contract drafted in French by reference to what the term would mean to a reasonable person with an understanding of the French language, and we do not see it as a material departure from existing principles. This would allow the court to take into account what the code appeared to instruct the computer to do, regardless of what the performance of the code actually achieved, which may be more relevant to the parties’ intentions, as you highlight in paragraph 4.27. However, other factors may also be relevant to the court’s determination. For example, if the parties have run verification and/or audit...
processes these may provide further insights into the parties’ intentions, objectively determined (as they will contribute to the background information available to the parties at the time of entering into the contract).

2.26 Question 26. Do you consider that performance of the coded terms of a smart contract cannot always be predicted based on a reading of the code? If so, can you provide examples or specific evidence of this occurring?

Based on our experience, we would tend to agree. We would highlight that commercial parties often run audit procedures to simulate the contract code and check the potential outcomes in different scenarios. This may technically provide a high degree of predictability, although in practice it may not be feasible to digest the consequences of all different outcomes (which may in some cases run into the thousands or more).

2.27 Question 27. What practical or procedural steps could the courts take to resolve disputes about the interpretation of the coded terms of a smart contract?

We agree with the suggestion in paragraph 4.29 of the Call for Evidence.

2.28 Question 28. Are parties utilising natural language in smart contracts to make their intentions clear in respect of any coded terms or the contract as a whole?

Yes, this is a common practice. See paragraph 1.2.4 above.

2.29 Question 29. In what (if any) circumstances should courts be able to consider evidence of the parties’ pre-contractual negotiations as an aid to interpretation of the coded terms of a smart contract?

We would strongly advise against departing from normal principles in order to elevate pre-contractual negotiations to a higher status than they would have outside the context of smart contracts. As outlined in paragraph 1.1.2, however, smart contract code alone cannot constitute a legal contract and extraneous evidence (including communications and conduct) will in some cases form part of a legal contract.

2.30 Question 30. Do you consider that the courts’ current approach to contractual interpretation might cause problems in the context of smart contracts? If so: (1) Can you provide examples or specific evidence of this occurring? (2) What could be done to solve these problems?

We do not see any fundamental issues with the courts’ current approach to contractual interpretation. In some cases involving less sophisticated parties there may be a shortage of evidence as to the parties’ intentions. There may also be more arrangements in which the parties are less familiar with what they have objectively agreed. However, these factors do not justify a fundamental departure from the general approach.

2.31 Question 31. Are you aware of, or do you foresee, any practical difficulties in ordering rectification of the coded terms of a smart contract? If so, do you think that parties to a smart contract will, in practice, seek rectification?

Practical difficulties can certainly arise when it comes to the rectification of smart contracts which run on DLT-based infrastructure. These difficulties are particularly acute in the context of decentralised multilateral smart contract arrangements. The use of master nodes with override functionalities (as described in paragraph 1.1.4 above) can be used to address many of these concerns in some contexts.
2.32 Question 32. Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether the parties have made a common mistake when entering into a smart contract?

No, in our view the same principles should continue to apply. As we have outlined in paragraph 1.2 above, if there is a lack of agreement as to the essential terms of the contract, then no contract will be formed, and we do not see any justification for departing from that principle. We would also flag that there are protections that parties sometimes employ to guard against certain types of common mistake. For example, so-called “fat-fingers” protections may be used to ensure that if a particular formulation falls outside anticipated parameters it is rejected by the system.

2.33 Question 33. What steps or precautions (if any) do parties typically take before entering into a smart contract to satisfy themselves that the code will execute as intended?

This varies significantly depending on the circumstances, including the sophistication of the parties and the values at stake. For example, some parties will transact on the blind faith that the code works as they expect it to, some will read the code to make sure they understand it and some will undertake verification and/or audit procedures to provide them with external assurances as to the potential outcomes of the code (as discussed in paragraph 1.1.3 above).

2.34 Question 34. Do you consider that the legal principles concerning unilateral mistake might need to be adapted to accommodate smart contracts concluded by computer programs without human intervention? In particular: (1) is it appropriate to confine a unilateral mistake to a mistake about a term of the contract? (2) what test should the court apply in determining whether the non-mistaken party had knowledge of the mistaken party’s mistake?

We do not see any particular justification for departing from the normal principles. As we have outlined in paragraph 1.2 above, if there is a lack of objective agreement as to the essential terms of the contract, then no contract will be formed. Furthermore, as noted in paragraph 2.25 above, the terms of the smart contract code should be interpreted by reference to the understanding of a reasonable person with an understanding of the code, rather than by looking merely at the outcome of the code as performed by a machine. This should provide the courts with a mechanism through which they can discard obvious errors in the code as outside the intentions of the parties.

2.35 Question 35. Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether a smart contract has been entered into as a result of a misrepresentation?

No, we agree that normal principles should apply. We would add that there may be further challenges in identifying a misrepresentation in a multilateral context, where, for example, multiple parties may have contributed to marketing materials (as discussed further in paragraph 1.2 above). However, as noted, often no legal contracts will arise in that scenario in the absence of detailed multilateral rulebooks.

2.36 Question 36. Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning rescission to smart contracts which have been vitiated for misrepresentation, duress or undue influence?

No, we agree that normal principles should apply. We would add that the practical challenges in rescinding arrangements may be more acute in a multilateral and pseudonymous context, where it may not be clear who should make restitution to whom (as discussed further in paragraph 1.2
above). However, as discussed, often no legal contracts will arise in such scenarios in the absence of detailed multilateral rulebooks.

2.37 **Question 37. Are you aware of, or do you foresee, any difficulties in awarding damages for breach of contract where the terms of a natural language contract are performed automatically by computer code?**

No, we agree that a party that delegates the performance of its contractual obligations to computer code should be liable under the contract in the usual way for any failures or defects in the performance of those obligations by the computer code (as you have highlighted in paragraph 5.84 of the Call for Evidence). There is nothing novel about this, as discussed in paragraphs 1.1.3 and 2.4 above.

2.38 **Question 38. Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning termination where the terms of a natural language contract are performed automatically by computer code?**

No, we agree normal principles should apply, despite potential practical challenges in aborting contract code in some cases.

2.39 **Question 39. Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning breach of contract to contracts recorded wholly or partly in computer code?**

As discussed in paragraph 2.25 above, in our view, in interpreting contract code that does form part of a legal contract, the court should ask what the term would mean to a reasonable person with an understanding of the relevant code. This will enable the court to discard obvious errors in the code as outside the intentions of the parties. In line with usual principles, the contract code should also be interpreted in the context of the wider agreement and the background knowledge available to the parties at the time of entering into the contract.

2.40 **Question 40. Are you aware of, or do you foresee, any difficulties in applying the law on frustration to smart contracts?**

No, we would expect normal principles to apply. In fact, it is likely that the law on frustration will be of more relevance in relation to some smart contracts, for example those relating to native decentralised cryptoassets which are vulnerable to various disruptive events, such as cyberattacks and forking. Often in these scenarios the applicable smart contract code will cease to operate in practice.

2.41 **Question 41. Can you provide examples of terms that parties have included (or might include) in the natural language element of the smart contract to address the risk that subsequent events might affect the performance of the code? Please explain: (1) the drafting of the provision; (2) the subsequent events covered by the provision; (3) the effect, under the provision, of the subsequent event on the contract; and (4) the remedies available to the parties under the provision.**

The drafting will vary dramatically depending on the circumstances and the risk allocation agreed between the parties. In some cases, the parties may simply agree that the smart contract will cease to have effect.

2.42 **Question 42. Are you aware of, or do you foresee, any difficulties in applying the illegality doctrine to claims made in relation to smart contracts?**
We would expect normal principles to apply. There is a distinction to be made between performance and enforcement – a claim may be unenforceable if it falls within the scope of the illegality doctrine, but it may nonetheless be performed if, for example, there are practical difficulties in aborting the contract code.

2.43 Question 43. Are you aware of any business to consumer smart contracts currently in use or in development? Please give details.

No comments.

2.44 Question 44. When would you estimate that smart contracts might be in common use in business to consumer contracts?

No comments.

2.45 Question 45. What challenges do you foresee in applying consumer protection laws to consumer contracts entered into wholly or partly in code? Are there any additional existing protections, beyond those we have discussed, which you think are or will be particularly important in the smart contract context?

No comments.

2.46 Question 46. What, if any, additional protections do you think are required for consumers entering into smart contracts? In particular, do you consider that there is a case for an explicit legal requirement that terms of a consumer contract which are fully or partly in code must be explained in natural language before the conclusion of the contract?

No comments.

2.47 Question 47. Are you aware of, or do you foresee, any difficulties in identifying the place of formation of a smart contract?

We agree that there may be considerable complexity in determining the place of contract formation, particularly in a multilateral context where the parties and nodes may be spread across several jurisdictions and the process of contract formation may not be linear, as discussed in paragraph 1.2 above.

2.48 Question 48. In what circumstances do you think that jurisdiction to hear a dispute in relation to a smart contract could be based on the actions and location of an agent?

We would flag that in a multilateral context, a smart contract may be made through an agent (such as a smart contract platform) which itself is located in multiple jurisdictions (for example, because it is governed through a decentralised structure) and/or though several agents (such as a group of validators) that are located in different jurisdictions. In these circumstances, it may be challenging to claim jurisdiction based on the actions and location of the agent through which the contract was made.

2.49 Question 49. Do you think that a rejection of state law in favour of the rules contained in the platform’s protocol is or should be a choice that can be given effect to under article 3(1) of the Rome I Regulation?

A court will typically only be able to enforce a system of rules by reference to an underlying governing law (for example, it will need to apply principles of contractual interpretation in accordance with a
We would generally advise parties to designate the law by which the arrangements provided for under their system rules should be governed, if indeed they intend to create legal relations. If the parties do not intend for their arrangements to be enforceable in a court of law then it may be the case that no legal contract has been formed.

**2.50** Question 50. Can an express choice of applicable law be embodied in computer code? If possible, please provide any practical examples of a coded clause expressing a choice of applicable law.

It is possible to include non-executable terms in a piece of smart contract code, as discussed in paragraph 1.1.2 above.

**2.51** Question 51. What factors are capable of connecting a smart contract to a particular jurisdiction, for the purposes of article 4(3) and 4(4) of the Rome I Regulation?

There are a number of factors capable of connecting a smart contract to a particular jurisdiction, as you identify in paragraph 7.82. We agree that there are significant challenges in finding the most significant or closest connection in circumstances where there are complex multilateral arrangements that span multiple jurisdictions. In practice, we would advise parties that intend to create a legally binding contract to include a choice of law and jurisdiction clause, within the framework of a multilateral rulebook where appropriate. As outlined in paragraph 1.2, in the absence of a legal framework agreement or other extraneous evidence of an intention to create legal relations and the intended terms, in many cases no legal contract will arise.

**2.52** Question 52. Are you aware of, or do you foresee, any difficulties in the context of smart contracts in applying the choice of law rules that apply under the Rome I Regulation to contracts of carriage (article 5), consumer contracts (article 6), insurance contracts (article 7) and individual employment contracts (article 8)?

No, the same principles should apply.

**2.53** Question 53. Do you think that a rule of jurisdiction based on the place of contractual performance can be applied where the performance takes place on a distributed ledger?

There may be difficulties with this, for the reasons you identify in paragraph 7.70. In practice, we would advise parties that intend to create a legally binding contract to include a choice of law and jurisdiction clause.

**2.54** Question 54. What factors do you think are capable of connecting a claim in relation to a smart contract to a particular jurisdiction?

See paragraph 2.51 above.

**2.55** Question 55. Which, if any, rules for establishing jurisdiction do you consider will be most problematic in the smart contracts context? Do you agree with our analysis of the issues as described in this call for evidence?

In many cases, the use of a choice of law and jurisdiction clause can address the conflicts of laws concerns in respect of smart contracts. However, arrangements involving proprietary matters where the applicable law is determined by reference to the *lex situs* of the relevant assets remain problematic. The *situs* of assets held solely through a distributed ledger (which by definition is distributed and can span several jurisdictions) is currently not clear. It would be helpful to have a common conflicts of law rule adopted internationally (for example by the Hague Conference on Private International Law, in collaboration with UNIDROIT and UNCITRAL) to enable the
participants in a system to agree to a uniform choice of law to be used as the situs of any tokens native to the system. In the context of both multilateral and bilateral arrangements involving proprietary interests, we have advised the parties to agree as between the participants of the systems the situs of the relevant assets as between themselves contractually and, in addition, create contractual rights (which may give rise to a separate proprietary interest) with a situs in, for example, England. Such an arrangement will not, however, be binding on third parties to the contractual arrangement who wish to assert adverse proprietary rights.

2.56 Question 56. Are there any issues we should be considering on smart contracts beyond those we discuss and ask about in this call for evidence?

See paragraph 1 above.

2.57 Question 57. Which other jurisdictions should we look to for their approach to smart contracts, and why?

No comments.

2.58 Question 58. Are there any legal reforms that you consider immediately necessary to remove uncertainty and unlock some of the potential benefits and cost savings of smart contracts?

See paragraphs 2.18, 2.19, 2.22 and 2.55 above. In addition, there are various legal reforms that would be helpful in relation to the use of distributed ledger technology and cryptoassets (for example, in relation to negotiability and tokenisation). We understand you are undertaking a separate project on this area and we would be happy to contribute to that work at a later stage.

We would welcome further discussion on any of these matters.

Yours sincerely,

Linklaters LLP
Lloyd’s response: Law Commission call for evidence on smart contracts

Lloyd’s is a Society of Members incorporated under the Lloyd’s Acts 1871-1982, which operates as an insurance and reinsurance market based in London. All insurance business in the Lloyd’s market is underwritten by Lloyd’s members, organised into 74 active syndicates, managed by managing agents. In 2019, the Lloyd’s market’s aggregate gross written premiums totalled £35.9bn. The business underwritten in the Lloyd’s market is primarily non-life insurance and reinsurance.

Lloyd’s welcomes the opportunity to comment on the Law Commission’s call for evidence on smart contracts. We have considered this consultation with parametric insurance products in mind because these products are often employed in tandem with smart contracts to synergise certain benefits (further described below in response to question 8). As such, we have not necessarily considered smart contracts purely in the context of distributed ledger technology-enabled automation, but with a wider sense of the automatic performance of contracts. Many of our comments draw on the practical experience of Lloyd’s market practitioners and other experts whom we have consulted, which we hope will provide insurance industry context to this work.

In terms of the legal position around parametric policies, Lloyd’s notes that the Law Commission provided a thorough examination of their structuring and designation in 2016 when undertaking its work on insurable interest. Whilst premiums in respect of parametric policies have remained relatively low since then, there is an expectation amongst the market practitioners we have consulted that parametric premium volumes are likely to grow significantly over time.

Although practitioners are satisfied overall that their parametric contracts are legal and suitable to be offered to market, there remains some uncertainty about the appropriate application of existing law to the relatively new mechanism of parametric covers. In particular, concerns centre around the extent to which insurance claims payments must correspond to the value of loss (and, by extension, the extent to which there must be a direct loss to the policyholder), an issue which we note that the Law Commission considers in its 2016 paper. In many cases, this is unlikely to be a pure legal issue as experience has shown that accounting rules also influence what is and is not permitted for insurance policies in practice. For example, practitioners have found that International Financial Reporting Standards (IFRS) do not permit over-indemnification, so claims payments cannot be higher than losses. Whilst we agree with the Law Commission’s existing analysis, we nevertheless consider it important to point out that there remains some legal uncertainty here which could be limiting the potential development of parametric products.

Should the Law Commission consider more specifically the law around parametric insurance contracts, Lloyd’s would welcome early engagement as innovation in this area is continuing at pace in the Lloyd’s market.
1. What kinds of contractual obligations can currently be automated using computer programs? Please provide specific examples where possible.

Below, we provide an in-depth case study of a parametric product sold via the Lloyd’s market which relies on automation via computer code. We also provide an example of service contracts in insurance and outline a number of other notable examples.

Case study – ‘Bounce’

Bounce is a parametric earthquake insurance product aimed at covering a protection gap in New Zealand for consumers and SMEs.

Bounce is sold on an online platform on a B2C basis. Premium is based on the policyholder’s location, utilising risk-based pricing at a postcode level. Bounce is triggered by seismic intensity using Peak Ground Velocity (PGV) with a stepped trigger to reduce basis risk. Bounce offers low sum insured values starting at NZD $10,000, with two further incremental steps of $20,000 and $50,000.

Bounce uses an integrated sales and claims reporting/settlement platform with automation on both sales and claims settlement. This is vital after a catastrophe event where rapid cashflow is needed. The PGV trigger is based on a universal metric which uses government data. Bounce will contact the insured when a triggering earthquake is detected at their nearest sensor.

Bounce utilises GeoNet, the New Zealand Earthquake Commission’s sensor network. This comprises approximately 330 sensors – 97% of the population lives within 30km of a sensor. The data is open source and free. The Bounce platform is Application Programming Interface (API)-integrated with GeoNet and can provide immediate claims notification to all potentially affected insureds automatically and continually. Extensive back-testing has been carried out on past quake events to ensure customer value.

A Bounce insurance policy is a 12-page wording, of which four make up the trigger, definitions and claims process (the remainder includes complaints, paramount and cyber exclusions etc). It has a simple customer journey, with clarity around the product and the pay-out eligibility at point of sale. Coverage is not dependent on physical damage, but based on a widely scoped loss criteria (with some restrictions to ensure insurable interest).

Notification of an event is by SMS message directing the insured to the Bounce website. GeoNet data integration to the Bounce admin system means that a list of affected insureds can be automatically identified and contacted. Handling is via a web form loss declaration so there is no paperwork or delays to payment. A proactive rather than reactive claims management process means that most claims are likely to be paid in days. Direct settlement to the client takes place via Bounce using a third-party payment processor, which allows Bounce to pay each claimant by direct credit into their bank account.
The benefits of Bounce include: the wide breadth of policy coverage allows for claims on losses or expenses that may not be covered under traditional insurance policies, utilising GeoNet removes the risk of conflict of interest as they are a third party independent data source and, it aims to settle all valid claims within five working days of a completed loss declaration, and in practice will likely exceed this target.

**Service contracts**
Outside the usual realm of insurance contracts delivering pecuniary benefits in the form of claims payments in the event of a loss, our market practitioners have indicated that certain other 'service'-type outcomes may also be triggered by smart insurance contracts. For example, 'Internet of Things'-enabled factories can use technological sensors to automatically obligate its insurer to deploy an engineer to perform repairs.

**Other instances**
We also heard from our practitioner group about the following instances where claims payments can be made automatically based on the use of computer programmes as part of the insurance policy infrastructure:

- Payment of insurance claims when triggered by an index.
- Determination of claim quanta based on programmatic output from input parameters (e.g. catastrophe bond payments made from escrowed catastrophe models).
- Automatic calculation of ‘time on risk’ based on and when assets are found to be bought and sold.
- Using automatic web observation to monitor for cloud failures which are used to assess payments in respect of cover for cloud outages.
- Using water sensors to automatically pay claims where floods have occurred.

2. **Do you agree that the Law Commission’s scoping study on smart contracts should be limited to contracts which use distributed ledger technology? If not, please provide details of other technologies which are used to support smart contracts, and their prevalence.**

No. We believe the scoping study should be more general to encompass other technologies that may be in use today or in the future. In other words, it should be technology neutral.

8. **What benefits and cost savings can smart contracts provide compared with traditional contracts? Will increased use of smart contracts lead to any additional costs? Please provide details and any available qualitative and quantitative evidence.**

In the context of insurance, the use of smart contracts may bring the following benefits:

- Fast claims payments. This is particularly important after disasters where liquidity is often needed quickly to minimise the impact on policyholders and to facilitate swifter recovery.
• Employing pre-defined claims settlement figures and/or automating the monitoring and analysis of objective triggers can reduce cost of loss adjustment. For example, using a trusted third-party oracle as an objective trigger for claims payment may increase the certainty as to whether a valid claim has arisen and its assigned value. Similarly, using objective third-party triggers limits the potential for disputes to arise, thereby reducing possible legal fees for both insurers and policyholders. These reductions in insurers’ expenses can ultimately result in lower premiums.

• As there is no ‘loss creep’ (i.e., loss estimates increasing over time with respect to a particular loss) with automated parametric products, insurers can have more certainty about their reserving and capital requirements.

However, the legal and compliance costs associated with the initial design and implementation of automated and parametric contracts may be higher than usual due to the novelty of the subject matter. The natural corollary of this is that costs would be expected to decrease over time and may settle at a lower level than for traditional products.

12. How common is it for parties to enter into smart contracts on a DLT system without knowing each other’s real identities and in what circumstances is this likely to arise?

Practitioners have found that it is very difficult to identify the insured on an online platform, but this is not a new issue – it has been relevant for years since products began to be sold online. To mitigate this, firms embed sanctions and know your customer (KYC) checks into their processes for online sales.

Bounce also asks questions during the buying process to ensure that the insured knows what they are purchasing to ensure an adequate sales process has taken place and that conduct risk can be mitigated. For this reason, firms are likely to store responses to questions that demonstrate that the customer knows what they are buying.

15. Are you aware of, or do you foresee, any difficulties in determining whether the parties to a smart contract have reached a certain and complete agreement? If possible, please provide examples.

We don’t see this as a problem, there will be offer and acceptance for these contracts and this is already done when buying insurance online.

24. In what circumstances might disputes arise about the proper interpretation of the coded terms of a smart contract? Please provide examples where possible.

Whilst not specifically about coded terms of a smart contract, Bounce provides a clear example about where the intersection of technology and contractual interpretation can lead to uncertainty. Their product resolves input data into horizontal and vertical components and triggers claims payments based on the maximum for either vector. However, it can be the case that the actual vector of movement has greater magnitude than either the horizontal or vertical component. The insurer found that a claim could have been triggered by movement
in the actual vector of movement during a particular earthquake, but was not triggered in respect of either of the component directions. This necessitated a re-evaluation of the way in which the contract and the technological inputs interacted with each other to ensure coherence.

25. Do you consider that the meaning of a coded term of a smart contract would or should be determined by asking what the term would mean to a:
(1) reasonable person;
(2) reasonable person with knowledge of the relevant code; or
(3) functioning computer?

In terms of the relevance to a court, we believe that it would be necessary to apply the standard of a reasonable person with knowledge of the relevant code in order to ensure a rational outcome. To apply the standard of a reasonable person could significantly inhibit the use of smart contracts by steering the design of coding languages towards comprehensibility, rather than utility.

However, our view is that the customer should be able to understand the contract itself in order to understand the product they are buying. This is an essential component of insurance conduct regulation and is an especially pronounced requirement in the context of consumer contracts. This does not mean that a consumer would necessarily be able to understand the code itself, but that they should be made aware of what it means and does.

26. Do you consider that performance of the coded terms of a smart contract cannot always be predicted based on a reading of the code?

If so, can you provide examples or specific evidence of this occurring?

The inputs to code will determine how it behaves – this is generally “predictable” – but sometimes you can be surprised by the inputs – for example, a sensor error might put an unexpected value into the code. That being said, there can be instances which cause code to become hard to predict, such as:

- Changes to firmware which could alter the way in which the code is interpreted by the machine.
- The type of sensor is changed and although “should” produce the same type of outputs actually produces different outputs (e.g. 64-bit outputs rather than 32-bit) – and then the code may execute these strangely.

Therefore, although the code will execute logically – the outcome may not have been what was “intended” in natural language.

33. What steps or precautions (if any) do parties typically take before entering into a smart contract to satisfy themselves that the code will execute as intended?

Hypothetical ‘edge testing’ is combined with tests based on past events to ensure that calculations and contracts operate as intended. For example, in an earthquake-triggered
Parametric it may be possible to use a previous earthquake and the proxy trigger data that was produced. In the case of Bounce, lots of testing took place using modelling scenarios, based partly on the Canterbury earthquake, to test what has happened before and what might happen in the future. This helps to ensure that undesirable outcomes are avoided, such as a policy paying out to one side of a street but not the other.

44. When would you estimate that smart contracts might be in common use in business to consumer contracts?

There are many examples of parametric products that are already sold direct to consumers such as FloodFlash, Bounce and Jumpstart, and we expect this market to continue to grow over time.

45. What challenges do you foresee in applying consumer protection laws to consumer contracts entered into wholly or partly in code? Are there any additional existing protections, beyond those we have discussed, which you think are or will be particularly important in the smart contract context?

From a regulatory perspective, we anticipate that the existing conduct framework and requirements for the insurance industry should continue to be sufficient because they are well established and based on principles which would apply in the smart contract and automated arena.

57. Which other jurisdictions should we look to for their approach to smart contracts, and why?

The experience of our practitioners has been that the UK is further ahead than other countries with respect to its capacity to incubate innovative contracts. By contrast, the Dodd-Frank Act in the US makes the use of these approaches more difficult. However, practitioners’ experience has been that India has relatively large volumes of agricultural parametric contracts and that Bermuda uses a digital marketplace solution from AkinovA, so these jurisdictions may be facilitative of new approaches.
Comments to the Call for evidence on the topic Smart Contracts

Introduction

I am a legal professional and I have a particular interest in development of smart contacts as they impact the field in which I worked for the last seven years – derivative agreements. On the topic I wrote an article and thought it might be helpful to reply to this call for evidence.

As the comments below are more on the theoretical side and not on the practical evidence, I thought it is a best to address them separately and focus on some of the key questions that Law Commission might consider.

I hope my comments are useful and I wish all the members of Law Commission success in all their endeavours to promote a fair and suitable legal framework in this area.

Part A: key questions

FORMATION AND ENFORCEABILITY

a) In what circumstances is a smart contract capable of giving rise to binding legal obligations, enforceable in accordance with its terms?

1. Smart Contracts Definition

To answer this question, the paragraphs 2.3 and 2.4 under the section Definition of Smart Contracts are most relevant for this discussion.

There is a conceptual difference between – computer program (a collection of instructions that can be executed by a computer to perform a specific task) and contract (an agreement between parties that creates obligations).

The paragraph 2.3 is stating that the smart contracts are computer programs however the next paragraph is discussing the contract. Usually to define something it is required a Genus and a specific difference. If the smart contract is a computer program then the definition should mention in the second part the distinction that differentiates this concept from the other computer programs.

Instead, the next paragraph states that the smart contract is a legally binding contract which can be performed automatically without the need for human intervention using DLT. In this case it should be assumed that all elements of the contract are present and discussion on the requirements for

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2 https://en.wikipedia.org/wiki/Computer_program
formation of a legally binding contract should be implied as satisfied. This is one of the assumption under which the Call for Evidence has been designed and it might be questionable as might be the results based on this assumption.

2. Social aspect

One point to be noted is that contracts have a social component – they create social relationships designed to direct the human behaviour even when they are strictly related to assets the human behaviour is actually targeted. If assets are moved, transferred, destroyed without reason and consent of people, the respective “transactions” cannot be acceptable at a large scale to the society that establish the rules in which humans can live, cooperate and interact.

3. Agreement & Intention – Contract Key elements

Therefore AGREEMENT, INTENTION is the key to any contract. The algorithms, machines do not have “intention” that is required in the space of contract and social relationships and agreement and intention implies a volitional aspect that can only be formed in natural language inside peoples minds.

4. Explainability

Furthermore, a human decision is usually made in consideration of the effects of such decision and therefore it is intrinsically related to causation. Efficiency should not replace causation if we would like to have a fair society in which humans are still responsible on how the things are run and for this reason accepting “contracts” with terms defined by a “black box” unintelligible and unexplainable to humans cannot be an acceptable result for society at large.

Therefore, to my mind the law should protect the value of the right to have an informed decision for people that are going to be affected by the transactions made using smart contracts. It is possible to have more efficient transactions when such transactions are entered by machines without any human intervention and optimise certain distribution of the wealth but when machine learning will take decision based on past statistics there might be odd results as it was with sexist Apple credit card.

It is of course possible to enact a law and give effects to any interaction machine-machine but it should be noted that ultimately the effects would impact human lives and it is doubtful that members of the society would accept effects that could not be explained and related to their own will and actions and to particular circumstances with a clear causation path attached.

A result that is caused by an automatic process should not be treated as a contract if there is no volitional aspect in the process and the state laws should not recognise an automatic process that was never intended by humans.

5. Practical matters

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3 https://www.bbc.co.uk/news/business-50365609
All the practical uses of smart contracts mentioned in the Call for Evidence reflect a trend in which the automation has been related to pre-existent standardised patterns of trading (e.g. derivative contracts, marine and parametric insurance contracts, supply chains, e-commerce platforms royalty distribution, etc.). In all these cases existing traditional contracts terms have been used and the computer programs have been designed to automate and replicate the effect of certain traditional contracts with the added benefit that the numerical input (e.g. price, location, quantity, etc) could be accessed immediately from a data base and increase efficiency in trading volume.

The use of smart contracts is therefore driven by the standardisation in traditional trading and the volume of such trading as there is no point to build a smart contract (in the sense of computer program that automates the performance) for a one traditional special/tailored made contract that has only one transaction between two parties that are so specific and not likely to be seen at a large scale between any other parties.

6. Automation

It should be inferred then, that the automation by using smart contracts is accessory to performance of a traditional contract even if in achieving automation some steps have been omitted. For example, the written contract in natural language is omitted as the computer program is directly written in code-machine but the smart contracts still aims to produce the effects of a traditional standard contract, only that the explicit terms included in the computer program are those that are strictly related to performance of the obligations (e.g. price, conditions for execution and numerical parameters – quantity, coordinates, etc) without the “boiler plate” clauses that are usually written in the (master) agreement in the case of a traditional contract.

In the peer to peer example the terms and conditions are included in the terms for using the platform and the transaction is made within the respective legal framework which again is a traditional contract expressed in natural language as the transaction is part of the (master) agreement to accept the terms for using the platform.

This is why to my mind the smart contract could only be accessory to a traditional contract as the smart contract is designed for automation of performance of a standardised contract that should be expressed in a complete form in a natural language to ensure that the intention of the parties have been considered as it is the case with traditional contracts and in such cases there is no deviation from standard contract interpretation principles.

7. Code vs. natural language

On this point, I would like to mention that I have leaned coding during my studies in Physics but this was never seen as a tool to describe a physical phenomenon but a series of instructions for the machine to perform certain operations and consequently much more restricted than the description of the physical phenomenon that includes external elements that are not necessarily depicted in the code but could affect the outcome and the understanding of the phenomenon. Therefore, the equivalence natural language and code-machine is very dangerous as it might threaten the correct understanding of the status of a certain relationship and legal effects attached to it.
b) **Is a smart contract between anonymous or pseudo-anonymous parties capable of giving rise to binding legal obligations?**

8. **Anonymity**

To my mind the answer should be NO to anonymity. As mentioned, contracts should be related to intention and agreement, to a person (being an individual or legal person) that has a will and can express this volitional aspect, has capacity to do so. The danger is that fraud and contracts that otherwise are void could be given legal effects like contacts with oneself or children that have not a capacity to enter in such legal agreements.

As for the moment the account is in the name of a person it might be possible theoretically to claim that the contract is void as made with a person that lack capacity if prove would be available that the kid was the one to order the games. However, if anonymous trading is acceptable it is hard to see how remedies could be available and enforceability ensured against unknown persons.

**Part B: possible additional questions for consideration**

(2) Other issues

(a) What factors will determine whether UK courts have jurisdiction, in the absence of a jurisdiction clause in the smart contract?

1. **Domestic Contracts vs International contracts**

As mentioned above, if the smart contract is accessory to a traditional contract then the classic rules on determining jurisdiction will apply. One point needs to be made in respect to territoriality and the choice of law: in many jurisdictions (e.g. civil law jurisdictions) this option is available only in the international contracts not in domestic contracts. Rome I is a convention that applies to private international law and it is understood to exclude domestic contracts. In such jurisdictions the legal assumption is that domestic contracts are subject to domestic law and another law will not be recognised by the courts as the matter is related to the concept of sovereignty of the state, as the state authorities should be entitled to regulate the social relationships on the respective territory. Therefore, an international convention might be needed in case there is a different approach to ensure enforcement of a choice other than domestic law in other jurisdictions.

2. **Scope of Rome I Convention**

Furthermore, Rome I only applies to traditional contracts and smart contracts are not seen within the scope of the respective convention as they are defined as computer programs, subject to copyright and related framework.
Question 57. Which other jurisdictions should we look to for their approach to smart contracts, and why?

Probably civil law jurisdictions should be looked to considering that more than 60% of the global population is governed by this type of law (including China, EU and Russia which are important players in digital innovation and important trading partners).

In addition it is likely that the legal framework for smart contracts will be created mostly via statues and possibly international convention that look to regulate the future in a new way than via precedents that try to use the past as example for the future. In my opinion some civil law jurisdictions might offer good examples for statutes that regulate new social phenomenon and that use concepts from legal theory not defined by judicial practice.

Question 58. Are there any legal reforms that you consider immediately necessary to remove uncertainty and unlock some of the potential benefits and cost savings of smart contracts?

My personal opinion is that the DLT platforms should be regulated and terms of use validated to ensure that the transactions made are binding and comply with the legal requirements at all times, and that no non-intended algorithm is build in by humans or by machine and to allocate responsibility for errors that might need to be remediated – data or algorithms non-compliant with the agreed terms.

Furthermore, some legal presumptions might need to be considered in respect to contract formation and evidence including signature.

On international side, it would require probably a convention to agree on jurisdictional issues and conditions to enforcement.
Response ID

Submitted to Law Commission call for evidence on smart contracts
Submitted on

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Name:

What is the name of your organisation?
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Chapter 2: What is a smart contract?

Question 1

Please share your views below:

We agree with the Call for Evidence. Any obligation that involves conditional logic can be automated; whereas the exercise of discretion is not an obligation that can (currently) be automated for want of sophisticated (and trusted) AI to exercise such discretion.

Examples of obligations that CAN (or COULD) be automated: Payments upon the occurrence of an event or the lapse of time; Title transfers of certain assets (crypto- assets) possibly other assets where the transfer of title can be automated (e.g. perhaps at HM Land Registry with an API?); provision of information (if access can be granted without a human in the loop).

Examples of obligations that CANNOT (currently) be automated: consent rights; any other exercise of discretion; obligations personal to humans (e.g. employment obligations).

A last thought is whether or not something that is automated by a computer program continues to be an obligation at all. We think of obligations as something that a party must do in the future. With a smart contract, the nature of obligations is changed: Instead of committing to perform an action at a point in the future, with a smart contract a party can irrevocably trigger the action straight away but the action will sit in obeyance until the conditions are met. There is no obligation on the party to do anything in the future. They have already done all that is required of them.

Question 2

Please share your views below:

No. DLT represents the future mainstream of smart contracts, but there are periphery obligations that might be smart contract (and may indeed be a gateway to the mainstream) that would also benefit from legal clarity.

For example, a single automatic payment obligation incorporated into a natural language contract need not use DLT, but could still be more efficient that a natural language obligation to do the same thing. Clear judicial treatment of such single smart obligations would pave the way for a wider assimilation.

Question 3

Please share your views below:
No comment in addition to the Call for Evidence

Question 4

Natural language contract with automated performance

Please provide examples of how these forms of smart contract have been used in practice:

Question 5

Please share your views below:

Question 6

Please share your views below:

We see a role for law firms to have an in-house coding team to provide these services.

Question 7

Please share your views below:

Not aware of any other uses

Question 8

Please share your views below:

Initially there is likely to be an increased cost in the settlement of a smart contract. It may be more expensive to draft and execute than its natural language counterpart, but there will be consequent savings during the life of the contract that will justify this.

Chapter 3: Formation of smart contracts

Question 9

Please share your views below:

We agree with the analysis in the Call for Evidence. The existing law has an established framework for identifying when the formalities of contract formation have been achieved and the legal principles can be applied to smart contracts in the same way.

Question 10

Please share your views below:

Not aware of any

Question 11

Please share your views below:

Question 12

Please share your views below:

Question 13

Please share your views below:

Question 14

Please share your views below:

Question 15

Please share your views below:

Question 16

Please share your views below:

Question 17
Please share your views below:

There will need to be some kind of natural language wording to affirm that entry into the smart contract IS intended to create legal relations. Without that, it is not clear that the mere act of clicking on a website button is sufficient. I see this as analogous to the warnings on sites such as eBay where the user is told something like ‘By clicking the YES button below you are entering into a binding legal agreement’ etc.

Question 18

Please share your views below:

Under the Act, “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. Source code may not fulfil this definition because it is not ‘words’. The fact that it is recorded and stored on a hard drive or in the cloud is not important in my view. That is likely to fulfil the definition of writing. It is whether or not source code constitutes ‘words’. A court could rule that words includes ‘coded instructions’, but this is far from assured and the best approach is in proactive amendment of the legislation to clarify this in advance.

Question 19

Please share your views below:

I don’t see why not, but am not aware of this. Docusign is helpful but of course but I have only seen that applied to natural language translations of code.

Question 20

Please share your views below:

Question 21

Please share your views below:

Question 22

Please share your views below:

Our view is that the current law in relation to deeds is not compatible with a hybrid agreement or one solely in code. The need for a physical document precludes that and greater certainty is required around execution.

Chapter 4: Interpretation of smart contracts

Question 23

Please share your views below:

Smart contracts will need a clause that sets out whether the code or the natural language will prevail in the event of a conflict between the two. We presume that the natural language will prevail initially.

Question 24

Please share your views below:

Question 25

Please share your views below:

I don’t think that it makes send for it to be a functioning computer. The computer will execute the code that it is given. Here we are trying to establish the intention of the parties, so is must be either 1 or 2. The circumstances may dictate which one it is, but the test as applied to the man on the Clapham Omnibus would favour 1

Question 26

Please share your views below:

Question 27

Please share your views below:

Question 28

Please share your views below:
Question 29

Please share your views below:

This will depend upon whether or not there is natural language included in the contract. If there is and there is also an entire agreement clause then, pre-contract negotiations should not be available, generally speaking, as is the case currently.

For a hybrid or only code contract, then there is a much stronger case for including pre-contract negotiations, but the same principles should apply. If the parties agree to an entire agreement provision, then where the terms are unclear it is for the courts to decide in the absence of statutory guidance as to interpretation.

Question 30

Please share your views below:
As you are kind enough to press me, I admit that two fairly general thoughts did occur to me.

1  Contracts expressed in code.

Source code can contain comments consisting of human-readable text and marked by symbols which ensure that the text is not compiled into operative machine code. Comments are usually used to explain the workings of the "operational" part of the code in order to assist anyone working on it, but they could of course be used to express contractual language.

In this way, a contract could in a sense be expressed in code. This seems completely pointless, however, since the code would not "work" (i.e. carry out the contract), and the contract would be more readable if written conventionally.

(If a contract is to be embedded in a blockchain for the benefits of immutability and public access, then that can be done as easily with a file consisting of a conventional word-processed text as with a piece of code consisting of textual comments.)

If a piece of code is designed to work, however, and to perform a contract, I find it hard to understand how it can be said to "express" the contract. To my mind a contract defines and imposes rights, powers, privileges and immunities, and their correlatives (to borrow Hohfeld's language). Code just performs actions. If one knows that code has operated between two parties contractually, or will do so, then one is presumably able to infer from it what their rights, etc, were or will be — one would "reverse-engineer" the contract out of the code's inputs and outputs and the relationships between them. But I do not think that such code can really be said to "express" the contract. It merely reflects it. Moreover, for the code to reflect an actual contract, not just a potential one, parties must be connected to it. They may be connected by acts (one party owns a machine and the other puts a coin into it) or by words ("We agree to be bound by the results of the running of smart-contract #123"). In neither case is the code binding by itself without the acts or the words, and so at best it is less than the whole of the contract.

This point is perhaps only about how properly to understand and describe smart contracts. It reflects some unease I felt, in reading the consultation, about how well it got to grips with what I think are the realities. I hope that other replies will illuminate the realities of what is in fact happening.

2  Errors in code

There is a considerable literature on the prevalence of errors in computer code, discussed helpfully at https://journals.sas.ac.uk/deeslr/article/view/5143/5027. To put it very briefly, errors are widespread, and are both hard to prevent when code is written and hard to detect when it is reviewed. Code in use requires regular updates to correct errors as they are found.

Code embedded in a blockchain cannot be corrected. It must be used as it is or not at all. What one party represents to another about its functioning, contractually or otherwise, is likely to be particularly important if the working of the code in some particular case is claimed to be affected by error. Those matters are outside the content of the code itself, of course; and where the parties contract to be
bound exclusively by the running of the code, they have no scope for application (consumer cases apart).

Resolving issues arising out of alleged errors in code is likely to involve a difficult and expensive clash of experts (see e.g. Bates v Post Office (No 6: Horizon Issues)). It may be especially difficult to resolve a dispute about whether an allegedly unexpected output from code is caused by an error rather than an intended design. If the parties must engage both lawyers and software engineers to devise their contracts, the complexity of the process is increased, and with it the risk of misunderstandings as a source of error.

The consultation paper’s analysis of the law of mistake and its implications for remedies seems to me very clear and helpful; but the paper does not appear to me to take adequate account of the prevalence of errors in code (widespread) as compared with errors in conventional contracts (in my experience fairly uncommon).

I hope these comments are helpful.

Regards,

Nicholas
Chapter 2: What is a smart contract?

Question 1

There is an issue raised by the definition used in the consultation paper as to the scope of a smart contract in that it is quite likely that many smart contracts will include some human user interaction (the ISO Reference Architecture standard, ISO/DIS 23257, nearing completion makes this clear); the human is one type of event generator or acceptor, other types are automated within or without the smart contract.

Many obligations can be automated as long as they can be deterministically defined (comprising if, then) rather than being open to interpretation.

Question 2

There are many definitions of “smart contract” and this increases the opportunity for confusion, especially where the consultation diverges from others.

The international standards definition (source ISO 22739:2020 Blockchain and distributed ledger technologies — Vocabulary) is restricted, like this consultation, to DLT but there are other publications that use the two terms smart contract and smart legal contract without being constrained to DLT. This raises a real issue for any legislation or even guidance in that many users will not know whether or not a DLT system is really behind a particular contract sometimes because it is not intended and other times it is claimed to be DLT but this is simply a malicious marketing claim to imply greater security than in fact is present.

Whilst it might be simpler to constrain the current work to smart contracts with DLT it is risky in that users will not necessarily understand or accept this restricted applicability.

ISO 22739:2020 definition:
Smart contract - computer program stored in a DLT system wherein the outcome of any execution of the program is recorded on the distributed ledger

Note 1 to entry: A smart contract can represent terms in a contract in law and create a legally enforceable obligation under the legislation of an applicable
jurisdiction.

Question 3

Please share your views below:

Permissioned DLT systems are those “requiring authorization to perform a particular activity or activities” (source ISO 22739:2020 Blockchain and distributed ledger technologies — Vocabulary). Interestingly, in addition, the ISO publications also differentiate between public and private DLT systems.

When parties wish to enter into a legally binding agreement using a smart contract on DLT it will be very unusual for them to wish to have their contractual relationship visible to all other users of the DLT system and as a consequence are expected to use a permissioned DLT whether access to it is private or public.

Question 4

Hybrid contract

Please provide examples of how these forms of smart contract have been used in practice:

There is a certain lack of clarity in the consultation paper between the first two types of smart contract.

In the first, if the smart contract is to automatically process an obligation then that obligation must be held within or accessible to the smart contract. In practice many deployments will record the obligation in the code as well as in the natural language. Maybe the distinction between the natural language and hybrid variants is that in the hybrid form some obligations are only recorded in the smart contract; is this what is intended? Where the natural language and code perform differently there will need to be clear precedence which may not be acceptable to any of the parties as they are not necessarily code literate.

The suggested process model as described in 2.34 and 2.35 is somewhat simplistic as in many cases the parties will be utilizing pre-built smart contracts (or smart contract components) that are supplied “off-the-shelf” by service providers and not developing bespoke code (themselves or using other 3rd parties). The responsibilities and liabilities of any of these 3rd party organizations will need to be taken into account; this is made more complex as a result of the sheer scale of the opportunity for errors in the source code, compilers, object code and infrastructure on which the code is deployed.

Question 5

Please share your views below:

An important aspect to note is that computer code can, and normally does, include natural language text to help document the code itself. Therefore it is important to recognize that natural language can be within the smart contract or externally (in which case it is imperative that the appropriate version of the natural language text is linked to the code).

The obligations that will be instantiated in code are those that are deterministic rather than open to interpretation (whether or not they also exist as natural language text).

Question 6

Please share your views below:

( 1) In many B2B smart contracts (e.g. in the supply chains) the organization or consortium offering the service will require use of the smart contract and DLT and will develop the smart contract rather than negotiate its creation. They will impose its use on participants contractually as a precondition of participation. This applies whatever the smart contract model adopted and will generally involve 3rd parties in the development of the complete service or system (which is considerably more complex than just the smart contract and DLT components).

( 3) Is a contract ever entered into before all the terms are available to all parties? If the answer is “no” then if a smart contract includes elements that are only included in code then only if the code is available for inspection at the same time as the natural language and is not obfuscated then the code elements of a hybrid smart contract will be able to be entered into at the same time as the natural language elements. In this scenario the natural language elements should not constitute a valid contract in isolation until the coded elements are also accepted.

( 4) In most real life examples the 3rd parties involved will include System Integrators, Staff Providers/Agencies and Consultancies as well as software developers and software providers; to suggest that it is just coders and software firms is overly simplistic and does not reflect on the way organizations approach development or acquisition of software.

In many situations smart contract security considerations and accepted good practice mean that the code will be obfuscated and will not be able to be read by an expert in the computer language used to develop it.

It is not reasonable to assume that the code of a smart contract can be read (this approach is used to protect IP in computer code to prevent improper reuse and reverse engineering).

Question 7

Please share your views below:

All DLT use cases involve smart contracts (but some may not meet the Law Commission definition of having enforceable aspects) and the ISO TC307 has done significant work in this area, led by Caroline Thomas (who is a member of the BSI mirror committee, DLT/1), and ISO TR 3242 Blockchain and distributed ledger
technologies – Use cases is drafted and currently being commented/voted upon by national standards bodies around the world.

Question 8

Please share your views below:

Chapter 3: Formation of smart contracts

Question 9

Please share your views below:

It should be noted that programming languages and compliers are, like the smart contracts themselves, software that may (or are likely to) include errors that have unforeseen consequences; this includes DAML (which can also be used with classic databases as well as DLT).

Question 10

Please share your views below:

If the programming language for the smart contract is Turing complete the developer may produce an application that has a user interface enabling an “I accept” dialogue that can effect a transaction to the DLT (human interaction) whether or not the programming language directly offers “acceptance” functionality.

Such interaction is as described in ISO/DIS 23257 Blockchain and distributed ledger technologies — Reference architecture.

Question 11

Please share your views below:

Do not see anything to disagree with the suggestions in the consultation paper that two smart contracts could make an offer and acceptance autonomously with an included consideration.

Question 12

Please share your views below:

The consultation paper generally refers to the natural language elements of a smart contract as having existence prior to and outside the coded components; this is not always the case as frequently the only place the natural language will exist is within the smart contract computer program (as comments in the code). This means that in these circumstances the identity of any party involved in the contract may not be known to the others, unlike the scenario described in the consultation paper.

This consultation paper question raises an interesting issue, what exactly is a “real identity”? It is generally unnecessary to check on the claims that someone is who they purport to be for most contracts, and quite significantly where the party is the representative of an organization that is more pertinent than their actual identity.

Consequently, for most smart contracts even those that do not claim to offer either anonymity or pseudonymity there is a high degree of likelihood that identity claims are unverifiable to a high degree of trust unless designed into the DLT based system.

It should be noted that the pseudonym that a party uses might simply be an alternate name rather than a public address.

Question 13

Please share your views below:

This will depend upon the design of the DLT system complemented by the usual range of techniques to link computers and computer usage to real world locations and people.

Question 14

Please share your views below:

No difficulties foreseen outside those of jurisdiction as discussed elsewhere.

Question 15

Please share your views below:

Having a necessary part of a computer source program not present (by intent or omission) does not necessarily mean it will not compile or execute (some programming languages are interpreted rather than compiled); it may be a valid program albeit incomplete in certain aspects.

Code can be valid and executable but not perform in the intended or expected manner; this is analogous to the English language where simple differences can be valid but have significant differences in meaning (e.g. “eats shoots and leaves” versus “eats, shoots and leaves”).
“Correct syntax and which contains all essential instructions” does not mean that the code is error free and that “all essential instructions” will be performed in practice as intended by the developer or contracting parties. A simple error in capitalization in the code for specific data can mean that an expected outcome based on an intended input does not occur. This was the case in the infamous DAO situation where the smart contract executed satisfactorily but there was an error in the programming that enabled malicious behaviour by involved parties.

Consequently, and addressing the specific question, the natural language elements may be complete but the coded elements are not.

**Question 16**

*Please share your views below:*  

**Question 17**

*Please share your views below:*  

**Question 18**

*Please share your views below:*  

The discourse at 3.58 is somewhat naïve in that it is quite simple to read and interpret EDI messages by a person.

The usage of the term “binary data” and suggesting that this cannot be read in a visible form is quite amusing as the Law Commission Consultation Paper is actually held as binary data (like everything else in the digital world) which can only be read by another computer system according to the same protocol (in this case PDF as defined in ISO 32000 series of standards).

This sort of statement shows a startling lack of understanding which discredits the whole document.

The issues with 3.59 and 3.60 and source code being “in writing” are somewhat more complex than the consultation paper suggests as the accuracy of the compilation conversion from source to object is analogous to translation into a foreign natural language; the source code may be readable in English but the compiler (another potentially error prone software stack) then translates this to the best of its ability into object code which is a language executable by the computer.

Will the compiler producer or vendor accept responsibility for unintended results of the translation performed by its product? Not likely! Especially as the performance of this product will be dependent on other software in the computer (e.g. operating system).

Whether source code can be “sufficiently evidenced “in writing” will obviously depend on the interpretation of sufficiency and therefore, as a non-legal opinion, it would be highly dangerous to regard source code as meeting the definition of “in writing”.

Natural language may or may not be included in the source code and there may or may not be relevant natural language external to the source code. This means there will be circumstances where the smart contract is totally devoid of natural language and whilst the source code may be interpreted by a natural person there could well be different interpretations by different “experts” and additionally the object code may not function in the same manner as any of these “experts” expected.

**Question 19**

*Please share your views below:*  

Having an agreement “solely in code” does not mean that there is no opportunity for user interaction via a GUI on a device interacting with the smart contract and not necessarily the computers on which the smart contract is executing; as such all options for signing as discussed in the Law Commission report on Electronic Execution are possible (with different degrees of robustness and trustworthiness for the different signing approaches).

This question should probably not be separated from Q9&10 as the issue is not really about signing the smart contract but indicating acceptance to be bound by it.

**Question 20**

*Please share your views below:*  

There is nothing to prevent an eIDAS signature from being used in a smart contract using DLT and there is nothing to restrict such systems to these signature types.

Many smart contract systems will wish to avoid the personal identification inherent in eIDAS and the takeup of eIDAS signatures in UK is still very, very low.

Maybe the question should consider how strongly authenticated issuance of digital certificates to individuals to give trustworthy electronic signatures using digital signing techniques could be required and used rather than getting into the weeds and undergrowth of eIDAS.

**Question 21**

*Please share your views below:*
The Law Commission Report on Electronic Execution is quite clear on the subject of deeds.

The use of a smart contract and DLT does not mean that the smart contract code itself would need to be signed. Normally a deed would be the personalized transactions using the smart contract in question rather than the code itself unless all personalizations are hard coded rather than variables captured transactionally when the contract executes on the computers.

Question 22

Please share your views below::

Because of the manner in which transactions are added to DLT systems (individually or in blocks) it is unlikely that the smart contract, transactional personalization (like signature and attestation) would be able to be considered as a single physical document even though they would be cryptographically linked.

Chapter 4: Interpretation of smart contracts

Question 23

Please share your views below::

Para 4.4 makes it clear that primacy will continue to be given to natural and ordinary meaning of words and, in the context of smart contracts this means that natural language (wherever present) will be give primacy over source code over object code unless contracting parties agree (and are able to agree) otherwise.

Para 4.8 presumes that most smart contracts will involve prior natural language negotiations; this is unlikely to be the way the market develops as it is the province of large organizations contracting with other large organizations on a bespoke basis whereas bigger take up will be from small organizations or individuals contracting with organizations or consortia (who specify the agreement terms). Only in the case where equal parties negotiate a bespoke agreement is there a level playing field.; in most cases one party to the agreement (the larger organization or consortium) will be controlling both the natural language and the smart contract code (source and object) and the other parties will have little or no real control as they want or need the service/product.

Interpretation will need to consider the relative power of the contracting parties exercised before the contract was accepted.

Question 24

Please share your views below::

The code may not perform in the manner expected by either party to the smart contract as a consequence of errors or omissions in the programming that was not detected during the testing; this may be because the testing did not consider a sufficient range of circumstances.

The developer of the smart contract should retain documented information including source code, design, test plans and results (as this may be required to be disclosed).

As the performance of the smart contract code may be dependent on external action or events (e.g. data provided by a DLT oracle from a sensor or data service) there will be a dependency on the proper functioning of that external source and that the source provides trustworthy data in the expected format.

Disputes will occur if a DLT oracle provides “out of range”, unexpected or erroneous data or the data format is incorrectly presented or interpreted by the smart contract program.

Question 25

Please share your views below:

Clearly a reasonable person without knowledge of the relevant programming language would be unable to give guidance on the interpretation of the meaning of a coded term in the context of the whole smart contract program and all the external services that it operates I conjunction with.

A reasonable person with knowledge of the relevant programming language could give advice but it should be noted that even if such inspection was rigorous there would still be errors or security vulnerabilities as is shown by many widely available and well used programs.

Such an examination may show what was intended but it is also important to consider what the program actually did in practice, the meaning to the functioning computer (this is especially important where there is no natural language to refer to). An error could be something as simple as incorrect capitalization of a data element (this sort of error is not always easy to spot in a long piece of source code but the functioning computer will react consistently).

Question 26

Please share your views below::

The DAO controversy (https://www.frontiersin.org/articles/10.3389/fbloc.2020.00025/full ) is an infamous and classic example of how difficult it can be for the developers and readers of source code to predict the performance in practice. In this case a feature in the smart contract was identified sometime after initial deployment of the smart contract but after many experts had examined the open source code extensively (and invested in the organization).

The vulnerability was exploited by someone who claimed they “decided to participate after finding the feature where splitting is rewarded with additional ether. I have made use of this feature and have rightfully claimed 3,641,894 ether, and would like to thank The DAO for this reward”.

483
Other parties involved were not sympathetic even though this claim was in accord with the terms of service of The DAO and these parties regarded the action as theft (as their investment was affected by this diversion of value).

Interestingly in response, the Ethereum blockchain was subject to a hard fork, whereby the chain was re-set to its position before the diversion of funds occurred (history was re-written); this was only partially successful as the whole community using The DAO were not convinced that this was a legitimate governance action and so two chains continued in parallel (without and with the hard fork).


Question 27

Please share your views below:

Question 28

Please share your views below:

Question 29

Please share your views below:

Question 30

Please share your views below:

Chapter 5: Remedies and smart contracts

Question 31

Please share your views below:

Question 32

Please share your views below:

Question 33

Please share your views below:

Question 34

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Question 35

Please share your views below:

Question 36

Please share your views below:

Question 37

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Question 38

Please share your views below:

Question 39

Please share your views below:

A coded obligation may be dependent on an external event (e.g. DLT oracle) in which case the reasonable coder (who is an expert witness) and the reasonable coder (who wrote the program, assuming that the developer was selected because they were reasonably competent) may both be unable to predict the outcome of an unexpected and unknown input to the smart contract program. The system is wider than simply the contracting parties, the smart contract program and the DLT platform; there may be flaws in the DLT platform that affect the manner in which transactions are presented and then accepted (or not) onto the DLT.

In many current and expected situations with smart contracts the program does not contain, as code, the variables (e.g. price per unit, currency, etc.) applied to a specific instantiation of the contract. These are added as the contract is negotiated (digitally) prior to acceptance and may be supplied by DLT oracle, user input
The value of these variables are added to the DLT through transactions but not the code of the smart contract; this is a generic case that does not figure significantly in the Law Commission consultation paper.

Question 40

Please share your views below:

Question 41

Please share your views below:

Question 42

Please share your views below:

Chapter 6: Consumers and smart contracts

Question 43

Please share your views below:

A real concern in this area is whether or not a consumer will be able to differentiate between a smart contract and another programmatic contractual service and whether or not the program the consumer is interacting with is actually storing contractually significant information on a DLT.

The answer to both must be that the consumer will not be in a position to know one way or the other. This has significant ramifications in the event of any dispute.

The reason the answer must be so is that the developer of the smart contract can generate an accessible user interface with the same complexity as any UI delivered without a smart contract and the consumer will always be unaware of the detailed technology behind any similar service (even if the code is open source there is little the consumer can do to be certain that the source code corresponds to the object code of an application and any reference to a back end service that seems like a DLT could easily be falsified).

Many of the example use cases cited in the consultation paper are examples of B2C smart contracts.

Question 44

Please share your views below:

Question 45

Please share your views below:

Question 46

Please share your views below:

Safeguards should be independent of the programming approach or database used as consumers will not be able to differentiate between smart contracts and other contracts entered into digitally or using/not using DLT.

Chapter 7: Jurisdiction and smart contracts

Question 47

Please share your views below:

This is a very complex area from a technology platform perspective as the DLT nodes are potentially all running the smart contract and may be in multiple geographic locations (and hence different jurisdictions) and the smart contract is deployed across many, not one, node. Deployment of a smart contract does not load on a single node.

Also, the parties may be interacting with the smart contract whilst not in the location from whence the action to deploy is triggered (as they may be anywhere with internet access, stationary or in transit).

Many smart contracts will involve multiple contracting parties (rather than just two) which further adds to the complexity.

Question 48

Please share your views below:

Question 49
Please share your views below:

Question 50

Please share your views below:

If the programming language of the smart contract is Turing complete (as many are), the developer can include interaction with the contracting parties and present an interactive screen based dialogue that includes selection from a set of choices. This set of choices could include a choice of applicable law. However, in some circumstances (e.g. B2C) it may not be possible to choose applicable law as it may be imposed by other circumstances (e.g. location of the seller or purchaser) in which case clear precedence must be imposed.

Question 51

Please share your views below:

Question 52

Please share your views below:

Question 53

Please share your views below:

Question 54

Please share your views below:

Question 55

Please share your views below:

Chapter 8: Final questions

Question 56

Please share your views below:

There is a presumption throughout the consultation paper that DLT records are unchangeable.

The DOA incident and the hard fork that was implemented to overcome the diversion of Ether effectively re-wrote history and previously accepted ledger records were disenfranchised – this shows that immutability is not an absolute with DLT systems.

ISO 22739:2020 Blockchain and distributed ledger technologies — Vocabulary

3.38 hard fork
change to a DLT platform (3.29) in which new ledger records (3.44) or blocks (3.2) created by the DLT nodes (3.27) using the new version of the DLT platform (3.29) are not accepted as valid by DLT nodes (3.27) using old versions of the DLT platform (3.29).

Note 1 to entry: If not adopted by all DLT nodes (3.27), a hard fork can result in a ledger split (3.45).

Note 2 to entry: In some contexts, the terms "hard fork" and "fork" (3.45) are sometimes used for a ledger split (3.45) that results from a hard fork of a DLT platform (3.29).

Furthermore, there is an approach patented by Accenture (https://www.accenture.com/gb-en/insight-editing-uneditable-blockchain) that enables the editing of un-editable blockchain. Another demonstration that immutability is not an absolute.

There is an overall impression given that smart contracts will be bespoke code created after some degree of negotiation. Whilst this may be true for those entered into between multiple large organizations the majority of smart contracts will be either created by or for a large organization and then deployed for contracting counterparties to enter into. These will not give the smaller parties any real opportunity to inspect the smart contract upfront.

Additionally many smart contracts will be developed by third parties not associated with any of the contracting counterparties. These smart contracts being subsequently sold by the developer or selected from a suitable library.

Question 57

Please share your views below:

Question 58

Please share your views below:
Response to “Call for evidence: smart contracts”

Christian Twigg-Flesner, Professor of International Commercial Law, University of Warwick

I am only able to offer a general response with some views on the approach underpinning the Law Commission’s call for evidence in this response. Many of the questions put in the call for evidence related to practical experience with “smart contracts”. Such practical evidence is crucial in order to identify the kinds of issues which this form of transacting might prompt.

It seems to me that the Law Commission has taken a rather uncritical view of both the potential of distributed ledger technology (blockchains) and “smart contracts” (see e.g., para.2.8). I think it would have been helpful in this call for evidence to acknowledge some of the more cautionary views regarding both blockchain generally and smart contracts specifically. An excellent paper on this by Low and Mik was published in the ICLQ in early 2020, and Mik has also separately urged some restraint about “smart contracts” and their real world potential. Indeed, whilst the technologists’ view of “smart contracts” will be overwhelmingly positive, and many legal commentators have adopted this perspective, there are some real issues about the role of “smart contracts” beyond their deployment for the automation of relatively routine elements of a commercial transactions. The importance of other factors, including the desire to build a commercial relationship based on trust (which is far more important than technologists would have us believe), needs to be taken into consideration.

Moreover, the thrust of the call for evidence is to start with the assumption that “smart contracts” will in some instances qualify as “smart legal contracts”, i.e., transactions which satisfy the conditions of English law for their recognition as legally enforceable contracts. This is the conclusion reached in the Legal Statement, of course. However, this essentially seems to be saying the obvious: if a transaction has all the features English law requires of a legally enforceable contract, then the transaction is a legally enforceable contract. From this, the inevitable question is whether and how the various components of English Contract Law could then be applied to the three types of “smart contract” identified by the Law Commission for the purposes of this call for evidence. The analysis of this in the call for evidence is thorough and generally accurate.

But I don’t think that this gets us very far at all. The upshot is that we can try to apply Contract Law to those smart contracts which tick all the boxes for a legally enforceable contract. Two questions follow immediately:

(i) what about those smart contracts which do not, for whatever reason, tick all those boxes and would therefore fall outside the scope of contract law; and

(ii) whilst the treatment of some “smart contracts” as legally enforceable contract enables the immediate application of familiar rules to “smart contracts”, it does not address the

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1 K. Low and E. Mik, “Pause the Blockchain Revolution” (2020) 69 International and Comparative Law Quarterly 135
2 E. Mik, “Smart contracts: terminology, technical limitations and real world complexity” (2017) 9 Law, Innovation and Technology 269
3 K. Levy, “Book-Smart, not Street-Smart: Blockchain-based smart contracts and the social workings of law” (2017) 3 Engaging Science, Technology and Society (online)
4 UK Jurisdiction Taskforce, Legal statement on the status of cryptoassets and smart contracts under English and Welsh law (November 2019)
wider question whether this should be done. Is it right to push Contract Law well beyond its remit just because it is possible to find ways of applying (most of) the rules of Contract Law to the potential issues one might encounter with “smart contracts”? Roger Brownsword, for instance, has suggested that it would be more helpful to view contracts (in their traditional sense) as a part of the wider field of transactions, and that “smart contracts” might equally be regarded as a part of this wider field of transactions, but distinct from traditional contracts.\(^5\)

This second point relates to a more fundamental question about how law should treat the impact of digital technology and the type of approach that should be adopted. Again, reference to Roger Brownsword’s work is helpful here: he distinguishes broadly between a “coherentist” and a “regulatory-instrumentalist” mindset which determines the approach taken to adapting the law to technological developments.\(^6\) Put in a very simplified form, the “coherentist” approach to “smart contracts” is to align them as closely as possible with the law of contract and to avoid straying from this, whereas a “regulatory-instrumentalist” approach would focus more on the specific issues associated with “smart contracts”, particular the risks associated with this, and how the law could address those directly – without necessarily clinging to the law of contract.

My reading of the call for evidence is that it is very much on the coherentist side. Of course, this is a call for evidence and once clearer evidence about practical circumstances is obtained, further discussions might be open to a less coherentist view and consider an altogether different approach – I would certainly hope so. This would be particularly important for those “smart contracts” which have novel features going beyond the mere automation of the performance of elements of a traditional contract, i.e., transactions which are the result of algorithmic decisions and which do not involve any human intervention in the process of setting up such a transaction. (Incidentally, UNCITRAL has indicated that it will refrain from using the phrase “smart contract” or “smart legal contract” altogether in favour of referring to AI and automated systems.\(^7\))

As for the first issue (treatment of non-legal “smart contracts”), the call for evidence is limited to those smart contracts which cross the line and would be recognised as contracts in English law, but that seems to be an arbitrary dividing line. Surely many of the potential issues with “smart contracts” will arise with all types. For instance, the call for evidence rightly raises the problem about coding a contract and the problems which that could create\(^8\) (and the possible application of rectification in respect of those “smart contracts” which are also legal contracts). Would it not make more sense to deal with this issue (and other issues which might be identified) holistically? Thinking about this particular issue, in thinking about the application of rectification to (some) coding errors and the limitations as to the availability of rectification, should the question not be what sort of legal mechanisms should be in place to deal with this problem, rather than to presuppose that rectification will provide the answer? The basic objective of rectification is clearly relevant, but its

\(^5\) E.g., R. Brownsword, “Teaching the law of a contract in a world of new transactional technologies” in W. Swain and D. Campbell, Reimaging Contract Law Pedagogy (Routledge, 2019).


\(^8\) One instance which undermines the claim that DLT/blockchain and “smart contracts” deployed thereon are “trustless”, incidentally. Parties would have to trust the coders to get things right. Similarly, the involvement of “oracles” reintroduces the need for trust. At which point, therefore, are “smart contracts” no more useful than traditional contracts, or even less so?
requirements and limitations might well not be suitable for “smart contracts”, even if the doctrine could be applied to a point.

I have read the analysis of how English Contract Law would apply to “smart contracts” closely. Whilst some elements can be applied without straining too much, for others, the discussion felt to me to become rather artificial. I wonder if this was partly the result of the perspective taken for these chapters, which seemed to be looking from Contract Law onto “smart contracts”, rather than by looking for sound solutions to the particular issues to which “smart contracts” might give rise.

One small comment on the example in para 4.25 (“go to the shop and buy a newspaper. If there are any eggs, get a dozen”. I understand the point that is made here, but from my (admittedly rusty) knowledge of coding, presumably any coder will know that this basic statement would have to be broken down and coded so as to correctly code the logic of the statement which is clear to a human reader. So a computer might well also buy the 12 eggs, rather than 12 newspapers!

Forgive me for adopting a rather critical stance in this short response – this is entirely intended as constructive criticism. I do not wish this to be understood as saying that there is no need to consider what law reform steps are needed to accommodate “smart contracts”. Indeed, I think there is a need to do something, but that “something” needs to start from the particular practical issues which “smart contracts” are likely to create. In my view, the starting point should not be to ask how well Contract Law works when applied to “smart contracts”, but rather what the ideal solutions to the identified issues/concerns regarding “smart contracts” are or are likely to be, and to go from there.

Christian Twigg-Flesner
Response ID

Submitted to Law Commission call for evidence on smart contracts
Submitted on

About you

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Name:
Chris Willett and Mateja Durovic

What is the name of your organisation?

Enter the name of your organisation:

Are you responding to this consultation in a personal capacity or on behalf of your organisation?

Personal response

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If you want the information that you provide in response to this consultation to be treated as confidential, please explain to us why you regard the information as confidential. As explained in our privacy notice, we will take full account of your explanation but cannot give an assurance that confidentiality can be maintained in all circumstances.

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Chapter 2: What is a smart contract?

Question 1

Please share your views below:

Question 2

Please share your views below:

Question 3

Please share your views below:

Question 4

Not Answered

Please provide examples of how these forms of smart contract have been used in practice:

Question 5

Please share your views below:

Question 6

Please share your views below:

Question 7

Please share your views below:

Question 8
Chapter 3: Formation of smart contracts

Question 9

Please share your views below:

Question 10

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Question 22

Please share your views below:

Chapter 4: Interpretation of smart contracts

Question 23

Please share your views below:

Question 24

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Question 25
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Question 26
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Question 27
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Question 28
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Chapter 5: Remedies and smart contracts

Question 31
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Question 39
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Question 40
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Question 41
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Question 42
Chapter 6: Consumers and smart contracts

Question 43

Please share your views below:

Our argument is that in B2C contract law in particular (but also possibly in B2B):

- there are certain rights and remedies that need to be able to be exercised when they were designed to be exercised;
- the robotic and irrevocable nature of performance smart contracts (SCs) may hinder the exercise of these rights (especially in long term relationships);
- SCs should only be allowed to play a role if it can demonstrate that they can facilitate (and not hinder) the exercise of these rights: whether by interrupting its robotic performance of the contract, and itself delivering on these consumer rights; or by working in partnership with the human agents to deliver on the key rights.

Examples of threats posed by SCs

(a) Consumer rights/remedies for breach of important terms including those as to description, quality, fitness for particular purpose in goods and digital content (DC) contracts, and reasonable care in services contracts-Consumer rights Act (CRA) 2015, common law

These are intended to provide a practical, workable menu that recognises the weaker position of the consumer (in particular recognising that damages can only be part of this menu— that they do not in themselves necessarily provide adequate redress). Key remedies here are:

- Goods-short term refund (30 days).
- Goods and DC-repair or replacement (subject to impossibility/disproportionality defences); moving to price reduction/final refund (always for goods, sometimes for DC) based on impossibility/disproportionality defences or repair/replacement not being done within a reasonable time/without significant inconvenience and in the case of goods not being done effectively at the first attempt.
- Services-repeat performance (subject to impossibility defence), moving to price reduction based on the impossibility defence or repeat performance not being done within a reasonable time/without significant inconvenience.
- Goods, DC and services-common law damages and termination (latter where breach of condition or sufficiently serious breach of innominate term)

Now, in discrete one off contracts there should not be an issue: any sort of performance/delivery (smart or traditional) takes place in a moment/a day/some other relatively short discrete period, it is then over. If there are quality or other problems, ‘human’ debates take place as normal as to whether there is a breach, and so what remedies are available (including e.g. as to whether the consumer has acted within the 30 day short term rejection period, whether cure remedies are possible/proportionate, whether they have been exercised within a reasonable time/without inconvenience etc and so whether price reductions/long term refunds are available).

The problem is with long term relational contracts where goods, digital content or services are supplied continuously over a long period to which both parties are committed. What if the SC is wholly robotic and irreversible within the full contract period, i.e. there is no provision for complaining about breach of contract, claiming short term rejection rights within the 30 days period, claiming cure remedies, claiming the right to move to price reduction/final refund, claiming that the breaches are so serious as to terminate the long term contract and refuse further supplies?

This matters because it matters that these rights/remedies can be exercised when they are designed to be exercised-failure to ensure this means a failure to truly protect the consumer in their vulnerable position, and also failure to follow the ‘accessible law’ policy agenda underpinning the CRA.

From the point of view of recognising the weaker position of the consumer, in particular their weaker loss bearing ability relative to the business, refund matters because it enables the consumer to escape immediately and not to be saddled with sub-standard goods or DC. Prospective termination matters because it prevents further goods/DC/services being supplied by a supplier that the consumer may already have lost trust in. These remedies are time sensitive—it matters that they are available when they are supposed to happen, otherwise the consumer is left with a financial shortfall that can only be recovered later.

Also from the point of view of recognising the weaker position of the consumer and pursuit of the ‘accessible law’ agenda, cure remedies (repair, replacement, repeat performance) matter and again they are time sensitive in this regard. Cure remedies provide important protection of consumer interests and they make dispute settlement easier/enhance the accessible law agenda: They are a direct and obvious performance remedies, giving what the consumer wanted in the first place (not some abstract vague notion of compensation that sellers and buyers find more nebulous to negotiate out of court). They avoid consumers needing to go to the expense and inconvenience of going to a third party trader to get cure and then going back to the original ‘guilty’ party for compensation to cover the costs of this. This in turn avoids potential complex legal debates e.g. as to causation (e.g. to what extent was the problem caused/made worse by the third party trader?) or mitigation (e.g. could the consumer have gone to a cheaper third party trader?).

(b) Unfair terms regime under CRA 2015
This exists to protect the weaker consumer from procedural and substantive unfairness, particularly in relation to standard terms drafted by the trader. Key features for present purposes are that consumers can challenge the fairness of terms, and if the terms are unfair, they are not binding.

Again the problem here could be long term relational contracts to which both parties are committed; where the robotic irrevocable nature of the SC might mean there is no provision for complaining about the unfairness of terms once performance has commenced.

This would be a particular problem in relation to those terms that allow traders avoid liability for breach of contract, or to take action to vary the contract (price increase, diminished performance for consumer) or to take onerous enforcement action against the consumer for some sort of default. It is strongly in interests of protecting consumers that these issues are resolved in the moment. In terms of protection/recognising consumer vulnerability the point is that challenging the term there and then is about self-help action. In the case of an exemption clause, for instance, this is about recovering the loss quickly. In the case of the other sorts of terms it is about preventing loss arising in the first place: to stop the price increase (if need be by escaping the contract-one way of such a term being fair is if it allows consumers to respond by terminating the contract), to defend against the onerous enforcement (the removal of moveable property, paying over of money, loss of a tenancy, house etc).

So, in these various unfair term scenarios, instances, it is key often that the consumer wins the argument at the time: to stop the losses arising, or to quickly compensate for them. It is also important both from a protection and ‘accessible law’ point of view, as currently there is no damages remedy to compensate for use of an unfair term. Indeed, even if such a remedy were to be introduced, while it might help, it would not be enough: It would not be taken up by most consumers (for well-known reasons of cost, formality, apathy etc). In any case the accessible law policy is that issues should be resolved out of court. It is doubtful whether it could adequately compensate the loss and it would raise various uncertainties that run contrary to the accessible law policy: e.g. what exactly is your loss when consumers are subject to a price variation? They should receive the extra that was paid as a refund, but should they also receive something on top for their trouble, as lost interest? What if the trader’s performance varies to the detriment of the consumer? What is the loss here exactly e.g. where they deliver later, or a different type of thing? In the case of terms allowing for onerous enforcement, should damages involve distress etc? All in all, it is all a bit late and uncertain/complex!

Question 46
Please share your views below:

Chapter 7: Jurisdiction and smart contracts

Question 47
Please share your views below:

Question 48
Please share your views below:

Question 49
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Question 51
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Chapter 8: Final questions

Question 56
B2B contracts

The abovementioned consumer protection and accessible law concerns do not arise in B2B contracts as such. However, rules of B2B contract law are there to reflect and balance the respective commercial interests, so it is a matter of concern if the rights/remedies arising under such rules are in some way hindered by SCs. Also, there is a perennial concern with certainty in B2B contracts, and certainty is compromised if rights/remedies that the parties normally reasonably expect to be able to exercise, cannot in fact be exercised.

In this light, it seems at least possible that especially in longer term contracts, SCs might cause similar problems to those caused above in particular in relation to rights to terminate for breach of contract; to exercise other remedies that may be provided for in the express terms of the contract; and rights to challenge exemption clauses at common law or under the Unfair Contract Terms Act 1977. We have not yet given sufficient thought to these issues to comment further but we will be doing so soon.

Tests to be passed by the technology

So if technology is to be a servant not a master, the above issues must be addressed. Can the technology adapt itself to be the servant of key consumer and commercial interests and accessible law/commercial certainty? SCs should only be allowed to play a role if it can be demonstrated that they will not help (or at least not make it harder) to exercise important rights such as those discussed above.

There seem to be two likely possibilities:

(a) The SC interrupts its own performance and itself delivers on the key rights. This would require the technology to apply the rules in question, and then adjust the ‘performance’ such as to deliver on whatever rights/remedies are appropriate. This is done as we understand it, in the case, for example, of compensation rights for delayed flights. However, these are rather ‘black and white’ issues: the relevant time triggers for compensation and the amounts of compensation being specifically provided for in the law. However, a key problem with the rules we have been discussing above is that they often involve broad, open textured fairness/reasonableness type assessments: e.g. deciding if goods are of ‘satisfactory’ quality (taking into account price, description, condition, minor defects and many other factors); if it is ‘disproportionate’ or not for a consumer to obtain a replacement (depending on comparisons with the cost f repair, seriousness of the non-conformity and other factors); if a ‘reasonable time’ has passed, thereby allowing consumers to move from repair/replacement options to price reduction/final rejection (depending on type of goods, seriousness of defect, behaviour pf the parties etc); whether a breach is sufficiently serious to allow for termination of the contract (turning on the type of contract, type of breach, perhaps past custom and practice etc etc); or whether a term allowing for variation or excluding liability is ‘fair’ (taking into account e.g. how transparent it is, how substantively balanced, the other terms of the contract etc etc).

In short, it is likely to be extremely challenging, if not impossible, for the technology to perform such balancing tasks.

(b) The other possibility then is for the technology to work in partnership with the human agents to deliver on the rights. This would require it to be able to: (i) pause performance; (ii) allow human negotiation over the open-textured criteria and entitlement to the relevant right; and (iii) provide alternative ‘smart’ performance delivering the right in question.

It is very important to investigate whether this sort of partnership is possible.

If the technology cannot deliver in one of the above respects (or in some way that produces the same result), then it should not be afforded a significant role in B2C (nor possibly in B2B) contracting.

Question 57

Please share your views below::

Question 58

Please share your views below::
Response to: Law Commission seeks views on smart contracts | Law Commission

Joint response from: Professor David Lowe, Aston University (founder of the Neural Computing Research Group and the Mathematics Group), Chief Technology Officer and Executive Director at Digital Cognate and Charles Kerrigan, CMS

Q&A

• what is a smart contract?

DL – It is first important to differentiate real contracts from the blockchain-accepted use of the term “smart contracts” as perceived by Szabo from the mid 1990s where “the code is the contract”. Such software designed to implement transactions are neither smart nor contracts. More appropriate are the Ricardian contracts as introduced by Grigg in the 1990’s which are contextualised human parsable, printable documents which also embed instructions to be parsed by computer to execute agreement under specific clauses or conditions. In our response we refer to the modern day generalisation of the Ricardian contract as a “Ricardian agreement”, simply to differentiate to the current loose use of terminology. Perhaps outside of the current scope of enquiry, but note that nothing in the definitions restricts the discussion to blockchains or other types of decentralised ledgers as exclusive carrying technology platforms for such agreements.

CK – For the purposes of the consultation it is useful (a) to note the context that the number of smart contracts as programmers define them (i.e. executable code) is increasing far more rapidly than the number of smart contracts as lawyers define them (i.e. having the characteristics that make them enforceable by a court) and (b) to reference Ricardian agreements as containing the subset of smart contracts that most practising lawyers are thinking of and expecting to work with.

It may be outside the scope of the consultation but it may also be worth referencing (we are seeing these more and more in practice now): (a) the implications of decentralised finance and the work being done to build financial markets through smart contracts as programmers define them; (b) the post-contract environment, including the implications of contracts of adhesion; (c) contracts as NFTs

• formation of smart contracts

DL – True “Ricardian agreements” should immutably intertwine the legal intent of an agreement along with the self-executing and immutable auto-enforcing code that implements the actions agreed in the intent. This intertwined text+code document to be binding also needs to be transparent to all involved parties, always accessible, printable in its entirety, signed (cryptographically or otherwise) by all parties involved in the intent and this composite smart contract then needs “wrapping” in a way that can never be modified by any party, only augmented with subsequent amendments linked to all previous versions.

“Signing” in practice could be by cryptographically protected digital keys and the digital signing also needs to be an integral part of the “Ricardian agreements” for it to be implemented and subsequently enforced.
Law Commission seeks views on smart contracts

CK – The above list contains our thoughts on the practical implications for how English law could define a Ricardian contract in terms that would make them identifiable under the common law.

Alongside the definition, note the benefits for document storage, fraud prevention, integration of electronic signing into the “electronic” contracts.

- interpretation and smart contracts

DL – The interpretation is all in the human parsable text component of the “Ricardian agreements”, not in the code, that in the first instance needs to be agreed by all signatories. All parties can also see the “code” that executes specific clauses or conditions in the intent and their experts can argue over code until consensus prior to implementation and prior to signing the contract. Subsequently faulty code would be dealt with separate to the intent of the textual contract using existing approaches. Noting that any replacements, including code, would be added immutably to the prior existing agreement.

CK – This implies retaining a clear distinction (however described) between smart contracts and so called “smart legal contracts” (as adopted by the Accord Project, the BSI and others).

- remedies and smart contracts

DL – Remedies are more likely to be restorative than enforcement in practical “Ricardian agreement” deployment. Provided the “Ricardian agreements” are immutably saved and accessible to all relevant parties, then legally or morally imposed remediation leading to modifications can be implemented by creating a new version of the full “Ricardian agreement” taking priority but that is also immutably linked to the previous versions.

CK – This is potentially a big question linking to policy questions on the future role of courts, the nature of remedies under contract in a digital economy that features both greater integration and greater decentralisation, mandatory arbitration clauses, and Lord Hodge’s point on using unjust enrichment as a remedy for certain types of smart contract claims.

- consumers and smart contracts

DL – The “Ricardian agreement” should be the same in form as currently used for consumers, only that the execution path is changed, usually eliminating the need for third party confirmations. The requirement for transparency and accessibility of “Ricardian agreements” also should apply for consumers as actual or implied signatories to the “Ricardian agreement”.

CK – This links back to the point above on the post-contract environment that is now a subject of debate. We note that Ricardian contracts can be applied in ways that can facilitate policy aims.

- jurisdiction and smart contracts

DL – “Ricardian agreements” can flexibly allow for separate jurisdictions conditional upon events, actions or triggers. Separate jurisdictions could be dealt with by identified separate
clauses with different execution code attached to each clause linked to, for example, geographic triggers in the code affecting the execution of the clauses. Again, once agreed prior to consensus the uncertainty and interpretation of jurisdiction could be reduced through the intertwining of the code and the textual intent and ensuring the whole “Ricardian agreement” is human-readable.

CK – The original hard problem in this area but in our view best to face head on and build jurisdictional choice and control into the documents rather than let the issue lie where it falls.
Chapter 2: What is a smart contract?

Question 1

Please share your views below: :

Not a question I can answer

Question 2

Please share your views below::

No, I can see that many smart contracts may use DLT, and that there are particular problems when DLT is used, especially in terms of enforcing judgments against one of the parties. But it seems to me that the same problems about wholly automated performance can arise when DLT is not employed. (Indeed, similar problems arise with performance that is carried out by a human, if the process is purely ministerial, i.e., mechanical without any thought being put into the process.)

My concern is that if you confine the issues paper to contracts based on DLT, you will miss possible problems. Nearly all the issues you raise in the call paper seem to me to be just as likely with non-DLT automated performance.

Question 3

Please share your views below::

Not a question I can answer

Question 4

Not Answered

Please provide examples of how these forms of smart contract have been used in practice: :
Not a question I can answer from my own experience, but I would assume that the vast majority are natural language contracts with automated performance. I would think that solely code contracts are very rare indeed, probably limited to experimental interactions between coders. Every serious transaction is going to have a purpose that nearly all parties will formulate in words. What I can see is that the contract may not be formulated in natural language, just each party’s own purpose; and that each may have that purpose ‘translated’ into an algorithm which they then use to search for contracting partners. So if a supermarket chain wants to want to buy supplies of loo paper every time its stock falls below X rolls, it might set up an algorithm to search for the lowest price on offer for the quantity required and order it automatically, while a supplier might have its “offers” in a corresponding format, so that once the “buyer” has indicated acceptance and given its address for delivery and its bank details for payment, everything else follows automatically. Perhaps you would categorise that as a solely code contract, as neither will be privy to the other’s business process document. But each could still argue that the code in their or the other party’s algorithm did not match their intentions - and in many systems of law (though not English law) that might be grounds on which to avoid the contract for mistake.

Question 5

Please share your views below:

Not a question I can answer

Question 6

Please share your views below:

Not a question I can answer

Question 7

Please share your views below::

No, sorry.

Question 8

Please share your views below::

I assume that over time, smart contracts might produce the same sort of savings that were produced by the use of standard form contracts. In many senses the purposes are not so different - a standard form can enable a transaction to be designed in great detail, yet made very simply by persons with little training, who merely have to follow set rules; and the detail that the contract goes into to some extent renders it “judge-proof”.

Chapter 3: Formation of smart contracts

Question 9

Please share your views below:

Not a question I can answer

Question 10

Please share your views below::

Not a question I can answer

Question 11

Please share your views below::

I have never seen any difficulty with this, even if on each side we are dealing simply with a computer running algorithms. If the two sets of code are programmed to enter a transaction when certain conditions occur and those do occur, why would there not be a contract? (And we don't have to force all agreements into "offer" and "acceptance", which can sometimes be hard to identify, eg. Clarke v Dunraven.

Question 12

Please share your views below::

Not a question I can answer

Question 13

Please share your views below::

Not a question I can answer
Question 14

Please share your views below:

Possibly: if the program provides that in certain events A will do something that will benefit B, while B has to do no more than 'sign/click up' to the arrangement. But it will be a problem only if A wants to back out before the conditions occur. Once A has performed, whether to not B provided consideration is irrelevant, just as with a gift promise that has been performed so as to be a completed gift. I can't see this being a practical problem - but of you can use this project as a pretext for getting rid of the doctrine of consideration, so much the better!

Question 15

Please share your views below:

No more than with natural language contracts

Question 16

Please share your views below:

Not a question I can answer

Question 17

Please share your views below:

Not a question I can answer, I have no practical experience of DLT

Question 18

Please share your views below:

I find this more difficult now than I did in 2001! I think it may depend on the statutory context (so perhaps asking about the Interpretation Act is not the right question,) and what the state is seeking to achieve. If the purpose is to try to ensure that the parties know what they are doing, as with much consumer legislation, then I think the answer is no. If it is merely to give evidence that the transaction took place at a certain time (as is arguably the purpose of the requirement of the Financial Collateral Directive that the provision of the collateral and the arrangement can be evidenced in writing, then I think the requirement might be satisfied by source code - presumably a coder can explain what it means, so it's no different to natural language that has been rendered into and written down in code.
When the purpose is to provide a record of the terms of the agreement, I am less sure, but again I think source code might suffice.

Question 19

Please share your views below:

I see no reason why not, but again not a question I can answer from experience

Question 20

Please share your views below:

Not a question I can answer

Question 21

Please share your views below:

No

Question 22

Please share your views below:

Sufficiently arguable that clarification would be useful

Chapter 4: Interpretation of smart contracts

Question 23

Please share your views below:

I don't at present see any great difference between this situation and that where parties agree on a transaction and then sign a standard form contract that doesn't match the oral agreement.
Question 24

Please share your views below:  
I don't understand the question as put. To my (simplistic) mind there can be no question of interpreting code. Code does not have a meaning, it has an effect. The only question can be whether the code fits with any natural language terms or statements that preceded or accompany it.

Question 25

Please share your views below:  
Again I don't understand the question, for the reason given in my answer to qu 24.

I can certainly see that where there has been some form of exchange, or a statement by one party, in natural language, but the code does not do what it says on the tin, there can be questions about whether the disappointed party can rely on what was said, or the impression given, rather than what is in the code. And if the disappointed party has itself contracted via an algorithm rather than a personal decision, I can see that they might have been expected to read the other party’s code as well as their own. It's a bit like the question that arises under UCTA s 3(2)(b)(i) - what was it reasonable to expect? Clearly the party contracting on the other party’s WSTB is not expected to read every line of the standard terms, or they would reasonably expect just what the contract allows.

What I am unsure about is whether there might ever be cases where the contract is wholly in code but, because of something unusual in code supplied by one party's coder, it performs in a way that the other coder would not anticipate - so that a similar problem might arise. If there are standard ways of writing code for particular types of transaction - protocols? - and my code deviates from the established protocol in some way that is very hard to spot, then the effect of the code might that the other coder by surprise.

Question 26

Please share your views below:  
Not a question I can answer.

Question 27

Please share your views below:  
Not a question I can answer.

Question 28

Please share your views below:  
Not a question I can answer.

Question 29

Please share your views below:  
I don't think that's the right question. As you say later, the question is whether the effect of the code corresponds to the parties' (or sometimes one party's) intentions so that rectification or some other remedy can be ordered; and pre-contractual negotiations are admissible for rectification.

Question 30

Please share your views below:  
Not a question I can answer.

Chapter 5: Remedies and smart contracts

Question 31

Please share your views below:  
I wonder whether there would ever be a need for formal rectification; won't most cases involve performances that have already taken place? Then the question will be what was the real agreement and did the performance conform to it? (Ok, sometimes the court will say that the document should be rectified and then award a remedy for breach of it, but I have never seen the point unless the document is going to have some continued operation, or a third party may be affected.)

If the contract were continuing, then rectification would be useful; but I don't see how the court could carry it out itself. It would say that the code must be changed to produce such and such an effect, and I guess either a party or (in a permission system) the central administrator would be order to make the necessary modifications, on pain of being in contempt of court. Alternatively, one party could be ordered to make some counter-balancing payment or other performance.

What I am uncertain about is a topic that you don't mention - implied terms. Of course the ideal code contract will have no need of implied terms because it will be completely contingent, but we all know that completely contingent contracts exist only in the minds of (Chicago) economists. There will be gaps where the parties
just haven't anticipated what happened, and I don't think there should be a stronger presumption that the contract is complete than there is with a natural language contract. e.g. suppose an oracle suddenly starts supplying false data, should there be an implied term that the payments need not be made? (Was Quoine a bit like that?) I guess this would have to be solved in the same way - the performance that the code produced was not in conformity with the implied terms of the contract and there will have to be some adjustment - a balancing payment or damages

Question 32

Please share your views below:

(I think we are discussing common mistake as to facts or law only here.) No more than with natural language contracts. In the (very rare) event that the contract is void, restitution will have to be ordered.

Question 33

Please share your views below:

Not a question I can answer - but it's not a question about common mistake in the sense used in qu 32, but of either rectification or simply whether the performance complied with the contract.

Question 34

Please share your views below:

1. I don't see that smart contracts are different to natural language contracts in this respect. It's arguable in either type of contract that there should be relief if I knew or should have known of your mistake as to the facts and failing to warn you was not consistent with good faith. But that would fly in the face of common law tradition.
2. It's not clear at the moment whether there can be relief at common law if I should have known of your mistake as to the terms of the contract (ie as in Hartog) - in Canada they have said yes, and of course that was the point of Singapore's retention of the equitable doctrine. Personally, my view is that if I should have known that when you said X in fact you meant Y, then the contract should be void or perhaps voidable; if I actually knew, that there should be a contract for Y, at least if I appeared to agree (e.g. by accepting your offer without pointing out the mistake).

Question 35

Please share your views below:

No

Question 36

Please share your views below:

I guess the problem is that the contract is likely to have been fully executed before anyone realises there has been a misrep, but performance is no longer a bar. Affirmation only occurs once you know you have a right to rescind. If you are right about inability to restore the property now being less of a problem, that's not an issue. The third party right's bar is soluble the same way - you can't have your property back but why not award you restitution of its value? So no, other than the difficulty that if DLT is used the court may find it difficult or impossible to require a counter-transaction within the DLT system. But there should be no problem about at least monetary remedies outside the system.

Question 37

Please share your views below:

No, though see answer to qu 36.

Question 38

Please share your views below:

No - though if I am right that transactions will normally have been executed before the problem is noticed, termination may be of little practical significance. No doubt it will still be tried when the market has shifted against the party seeking to terminate.

Question 39

Please share your views below:

No

Question 40

Please share your views below:

It seems unlikely to arise save where the contract becomes illegal; but in any event, in principle, I don't see any great difficulty
Question 41

Please share your views below:

I am not in a position to answer.

Question 42

Please share your views below:

We have to remember that the doctrine of illegality is about refusing to enforce contracts, not about undoing ones that have already been performed. So I am not sure how often the doctrine will apply to smart contracts. I see scope for POCA!

Chapter 6: Consumers and smart contracts

Question 43

Please share your views below:

I am not in a position to answer this question.

Question 44

Please share your views below:

I am not in a position to answer this question.

Question 45

Please share your views below:

I think all smart consumer contracts will have to be accompanied by natural language information - indeed, that is to a large extent the position already, under the 2013 Regs, but there should be a full statement of the terms, which of course would then determine whether the code has or has not resulted in a proper performance of the contract.

Question 46

Please share your views below:

I think all smart consumer contracts will have to be accompanied by natural language information - indeed, that is to a large extent the position already, under the 2013 Regs, but there should be a full statement of the terms, which of course would then determine whether the code has or has not resulted in a proper performance of the contract.

Chapter 7: Jurisdiction and smart contracts

Question 47

Please share your views below:

I would rather leave the questions in this section to someone who knows more about private international law than I do!

Question 48

Please share your views below:

Question 49

Please share your views below:

Question 50

Please share your views below:

Question 51

Please share your views below:

Question 52

Please share your views below:
Chapter 8: Final questions

Question 56

Please share your views below:

Implied terms, see above

Question 57

Please share your views below:

I'm sorry: I have not studied how other systems are trying to tackle the issue.

Question 58

Please share your views below:

Not that I am aware of.
Chapter 2: What is a smart contract?

Question 1

Please share your views below:
In theory anything but in practice, it should be limited to simple highly repeated obligations. My co-author (Eliza Mik) and I explain why in "Pause the Blockchain Legal Revolution" (2020) 69 ICLQ 135.

Question 2

Please share your views below:
No. Many so-called smart contracts are not actually contracts and distributed ledger technology does not in fact offer the security many seem to think it does.

Question 3

Please share your views below:
Mostly because of hype and lack of understanding of the security flaws and/or lack of understanding of the implications on legal remedies.

Question 4

Not Answered

Please provide examples of how these forms of smart contract have been used in practice:

Question 5

Please share your views below:
Few contracting parties are able to read code and there is evidence to suggest that many parties employing smart contracts in the distributed ledger space don't actually understand their contractual rights. See my paper "Confronting Cryptomania: Can Equity Tame the Blockchain?" (2020) 14 J Eq 240.

Question 6
There is no evidence that coders are cheaper than lawyers and drafting in code is far more challenging than drafting in natural language as code does not permit for ambiguity. "Pause the Blockchain Legal Revolution" (2020) 69 ICLQ 135. Industry standards for bugs is also discouraging, particularly for smart contracts.

Chapter 3: Formation of smart contracts

There should be no difficulties to contracting through autonomous programs since the law of contract is sufficiently broad and general to encompass numerous modes of contracting. The challenge lies in cases where a party's private key is misused for this purpose. Once a smart contract is set in motion on a distributed ledger, it becomes very difficult to reverse.

While there is an indisputable mathematical link between a party's public key and private key, there is no similar link between his/her private key and him/herself. This is a serious problem with transacting via a public ledger.
Chapter 4: Interpretation of smart contracts

Question 23

Please share your views below:

Many parties underestimate the difficulties of coding and where the parties decide that the code is to prevail over the natural language component of a contract, this can give rise to unexpected outcomes. This may be more common than anticipated. The DAO incident is an example where parties apparently agreed to the equivalent of an entire contracts clause for the code but then reversed a "hack" that was permitted by the code. The facts relating to the DAO hack can be found in my paper "Bitcoins and other cryptocurrencies as property?" (2017) 9 LIT 235

Question 24

Please share your views below:

Chapter 5: Remedies and smart contracts

Question 31

Please share your views below:

If a smart contract is embedded on a distributed ledger, the impossibility of rectifying it will seriously impact the efficacy of the remedy of rectification. See "Confronting Cryptomania: Can Equity Tame the Blockchain".

Question 32

Please share your views below:

Question 33

Please share your views below:

Question 34

Please share your views below:

See Low and Mik, "Lost in Transmission: Unilateral Mistakes in Automated Contracts" (2020) 136 LQR 563

Question 35

Please share your views below:

Any misrepresentation that has occurred will be outside the code. The difficulties will lie in rescission since most distributed ledgers are designed to be censorship resistant, which is just pretty language for rectification resistance.

Question 36
See "Confronting Cryptomania: Can Equity Tame the Blockchain" on the impact of distributed ledgers on judicial remedies.

No unless the assets to be used to satisfy the award are recorded on a blockchain: see, again, "Confronting Cryptomania: Can Equity Tame the Blockchain".

Again, if embedded on a blockchain, it cannot be terminated, at least not without someone having superuser privileges. But if so, then a single point of failure is reintroduced to the so-called decentralised system.

Chapter 6: Consumers and smart contracts

Chapter 7: Jurisdiction and smart contracts
Question 52
Please share your views below:

Question 53
Please share your views below:

Question 54
Please share your views below:

Question 55
Please share your views below:

Chapter 8: Final questions

Question 56
Please share your views below:

Question 57
Please share your views below:

Question 58
Please share your views below:
Response ID: [REDACTED]

Submitted to: Law Commission call for evidence on smart contracts
Submitted on: [REDACTED]

About you

What is your name?
Name: [REDACTED]

What is the name of your organisation?
Enter the name of your organisation:
Slaughter and May

Are you responding to this consultation in a personal capacity or on behalf of your organisation?
Response on behalf of organisation

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Telephone number: [REDACTED]

If you want the information that you provide in response to this consultation to be treated as confidential, please explain to us why you regard the information as confidential. As explained in our privacy notice, we will take full account of your explanation but cannot give an assurance that confidentiality can be maintained in all circumstances.

Please explain to us why you regard the information as confidential:

Chapter 3: Formation of smart contracts

Question 9
Please share your views below:

Question 10
Please share your views below:

Question 11
Please share your views below:

We agree with the Law Commission’s statement that the decisions in Software Solutions and Quoine suggest that offer and acceptance can be effected by computer programmes without human intervention, where there is evidence that the parties have deployed those programs for the purpose of reaching an agreement.

This is a logical extension of the finding in Thornton both that: (a) an automated machine holding itself out as being ready to receive remuneration can constitute an offer, and (b) acceptance can occur via the fulfilment of a predetermined act, such as payment, and in the absence of a specific communication to the offeror.

We have further considered what kind of evidence might suggest that parties had deployed programmes for the purpose of reaching an agreement. While we do not have expertise in the area of computer programming, it is our assumption that this could be determined through an examination of the operation of the code. For instance, a programme might be mandated to accept an offer where that offer met certain ‘qualification criteria’ (as was the case in Software Solutions), or pricing algorithms might be used to determine whether a computer programme should buy or sell cryptocurrency (as with Quoine).

It is difficult to envisage circumstances under which autonomous computer programs would interact such that offer and acceptance appear to occur, and a transaction take place, but this was not encoded into the programmes. If this were to occur—for instance, because of a bug—we consider it unlikely that the requirements for offer and acceptance would be met.
Following the Law Commission’s lead, we have broken down our response to this question into three sections based on the form of smart contract under consideration, that is: (i) natural language contracts; (ii) contracts recorded solely in the code of a computer programme; and (iii) hybrid contracts.

(i) Natural language contracts

We agree with the Law Commission that, where a smart contract consists of a natural language agreement with automated performance by code, certainty and completeness are determined in the normal way. Novel legal considerations do not arise in this context.

(ii) Contracts recorded solely in the code of a computer programme

Where a smart contract consists solely of code, the Law Commission points out that the code will not run if it contains vague or inconsistent instructions. Accordingly, the Law Commission concludes that where a piece of code has been performed by a computer there may be little scope to argue that the agreement is uncertain or incomplete. We agree that this is the case where the code performs as expected.

What if, however, a smart contract code does not perform as intended by the parties and this could be evidenced by pre-contractual negotiations? For example, a developer could misinterpret instructions, or be given a list of headline requirements but then be given licence with the remainder of the code (and such licence could have significant impact on performance). Would this conflict threaten certainty and completeness?

This question seemingly turns on whether parties’ pre-contractual negotiations could obtain the status of contractual terms. Even if pre-contractual negotiations were admitted as an aid to interpretation of the coded terms of a smart contract (further discussed at Question 29 of this Call for Evidence) it is unlikely that they could be used as contractual terms against which certainty and completeness could be assessed.

As a result, the only parameters by which the certainty and completeness of the code can be assessed is the make-up of the code itself—its own internal logic. This means that, if the code runs, a smart contract recorded solely in the code of a computer programme can be certain and complete for legal purposes even if it can be said with certainty that it is completely wrong. It seems an odd result that a smart contract could be considered certain and complete when its performance is, immediately, at odds with the contracting intent all contracting parties.

(iii) Hybrid contracts

Finally we agree with the Law Commission that, in a case of a hybrid smart contract, conflicts between the natural language and code can be resolved in the usual manner, via interpretation of the court. We also agree that instances where the operation of the code would depart from the natural language provisions to such an extent that a contract would be rendered uncertain would be few in number. This is subject to the same concerns we have highlighted above when considering contracts recorded solely in the code of a computer programme.

Question 16

Please share your views below: 

Question 17

Please share your views below: 

We agree with the Law Commission’s assessment that, where a smart contract includes a natural language component, there is likely to be little difficulty in proving that the parties to a smart contract intended to create legal relations. As highlighted by the Law Commission, this stems from the fact that where there is an ‘express’ agreement (an agreement expressed in words) in a commercial context, intention to create legal relations is presumed.

The remainder of our response will focus on the scenario where agreement might be reached entirely on a distributed ledger, without any natural language documents or communications passing between the parties.

In our view the greatest obstacle to ascertaining whether parties intend to create legal relations when they transact on a distributed ledger arises from the general expectations of those who use a particular DLT system.

Sometimes, these expectations will be clear. For example, it should not be difficult to establish that a distributed ledger set up for interbank payments is intended to attract legally enforceable obligations. Similarly, a DLT system set up to train developers in a sandboxed environment is clearly not intended to give rise to legal
relations between parties.

In other cases, however, the court may have more difficulty. What of—for example—a DLT system which is accompanied by a white paper setting out the purpose of the system, where that white paper vocally disavows legal relations despite the fact that assets are being exchanged for payment? Or a DLT system within which utility tokens are circulated which have no intrinsic or implied value, to which subsequently value is ascribed owing to their scarcity and/or popularity?

Against this backdrop, we are unsure of the merits of the Law Commission’s suggestion that some agreements reached on a distributed ledger might be appropriately characterised as ‘express’ agreements, on the basis that code is a mode of representing or reproducing words. While a neat solution, it could produce strange results. Taking the Law Commission’s example:

...the DAML programming language...would enable Alice to ‘offer’ a piece of code to Bob, which Bob could then ‘accept’. The code which is offered and accepted would represent an agreement between Alice and Bob on the distributed ledger. In these circumstances, the code could be considered an ‘express’ agreement between Alice and Bob, to which the presumption in favour of an intention to create legal relations might apply.

What if Alice and Bob were transacting in our DLT sandbox, created to help train developers, and the code enabling Alice to “offer” a piece of code to Bob was part of a training exercise? A presumption of intention to create legal relations would be created in spite of the fact that the system was never intended to support the transfer of assets for payment.

In the context of a sandbox—in which it is obvious that legal relations were never intended to apply—this presumption is likely harmless. The party denying the legal effect of the document would find it easy to prove that the exchange was not intended to create legal relations. In fact, it is hard to envisage how this situation would ever end up in court in the first place.

But what of more nuanced scenarios, such as our DLT system which is accompanied by an anarchist white paper? Should, in the weighing of evidence, the content of the code be given such precedence in comparison with the overall ecosystem within which a transaction occurs?

We remain unsure whether the content of the code should be given such weight in court as to create a presumption of intention to create legal relations.

**Question 18**

Please share your views below::

We agree with the Law Commission that, where the terms of a smart contract are said to reside within the source code, this is capable of satisfying an “in writing” requirement. This conclusion stems from our assessment that source code is—further to the demands of the Interpretation Act 1978—a means of representing or reproducing words in a visible form (such as a series of commands), and is capable of being read by a human person when displayed on a screen.

**Question 19**

Please share your views below::

**Question 20**

Please share your views below: :

**Question 21**

Please share your views below: :

**Question 22**

Please share your views below::

**Chapter 4: Interpretation of smart contracts**

**Question 23**

Please share your views below::

**Question 24**

Please share your views below::

At paragraph 4.13 of its Call for Evidence, the Law Commission sets out a number of circumstances under which a dispute could arise about the proper interpretation of the coded terms of a smart contract.

We believe that these examples represent the most likely circumstances under which the coded terms of a smart contract would be referred to a court for interpretation. That is, circumstances where either:

(i) one party argues that the terms recorded in code should be rectified on the basis that they fail to give effect to the parties’ common intention at the time the coded terms were deployed; or
(ii) analysis of the coded terms of a hybrid smart contract is required to interpret the natural language terms of the smart contract; or

(iii) one party alleges that the performance of the code did not accord with what the coded terms ‘meant’ on their proper interpretation.

Question 25

Please share your views below:

The meaning of a coded term of a smart contract should be determined by asking what the term would mean to a reasonable person with knowledge of the relevant code. In reaching this conclusion, we first consider the alternative options: determining by reference to a reasonable person, and by reference to a functioning computer.

(i) Reasonable person

As the Law Commission observes, a reasonable person is unlikely to be able to understand the meaning of a coded term. To determine the meaning of a coded term of a smart contract by reference to a reasonable person is, therefore, to determine that the coded term is unintelligible to the court. This is not a productive approach.

(ii) Functioning computer

If, moreover, the meaning of a coded term of a smart contract is determined by a functioning computer, then the meaning of the coded term is reduced to its output.

As suggested by the Law Commission, this approach places limits on the interpretation of a coded term, because the context in which the term was produced is not taken into account. The Law Commission underscores the disadvantages of this approach by considering a situation where the code behaves in a manner contrary to the intentions of the parties. If the meaning of a coded term is determined by a functioning computer, the intentions of the parties are irrelevant to ascertaining its meaning.

We further observe that if the meaning of a coded term is reduced to its performance, there is no real room for the court to interpret the term at all: its meaning will be plain and immutable. While it may be the goal of some users of smart contracts to oust the influence of the courts, there will (most likely) always be circumstances under which context will be vital to understanding the meaning of a coded smart contract term. As a result, we do not find this approach to be productive.

(iii) Reasonable person with knowledge of the relevant code

We find compelling the argument that the meaning of a coded term of a smart contract should be determined by asking what the term would mean to a reasonable person with knowledge of the relevant code.

This, as the Law Commission highlights, introduces an increased reliance on expert evidence, not only to translate a coded term into natural language, but to make sense of the translation. We consider, however, this to be an acceptable trimming of the court’s competence.

This is in part because unless experts are used to interpret a coded term, the competence of the court is not merely trimmed but extinguished. As we have set out above, the reasonable person would not understand the coded term, and the functioning computer simply looks to the performance of the coded term.

We find persuasive, moreover, the analogy the Law Commission draws with the Bolam test in the tort of negligence.

As a result we agree with the Law Commission’s suggestion that the opinion of an expert coder will be useful to a court, as it gives insight into what the code appeared to instruct the computer to do, regardless of what the performance of the code actually achieved. We further agree with the Law Commission’s observation that, where experts disagree about the likely operation or effect of coded terms, the courts might resolve that disagreement between experts in its usual manner.

Question 26

Please share your views below:

Question 27

Please share your views below:

Question 28

Please share your views below:

Question 29

Please share your views below:

Where a smart contract is recorded solely in the code of a computer programme, we believe it is necessary to consider evidence of the parties’ pre-contractual negotiations as an aid to interpretation of the coded terms of a smart contract.
As the Law Commission points out, reviewing these interactions could provide the court with better insight into what the parties intended the code to do, especially where parties are not code literate and may have completed all negotiations in natural languages. Under such circumstances, moreover, the risk that such negotiations may not reflect the final position the parties took when they entered the contract is greatly attenuated. This is because the final position of the parties is likely to be reflected in a business process document provided by the parties to a coder, or in emails between the parties.

The risk that admitting such evidence would prejudice the interests of third parties who have relied on the meaning of the contract as written may also decrease: we imagine that there are fewer third parties who could look at coded terms and, from them, decipher the meaning of the contract and then rely upon it.

Where the smart contract is a hybrid contract, however, the position is less clear. In these circumstances it is likely that a flexible, case-by-case approach will need to be taken, depending on the extent and content of the natural language component of the contract. Where the natural language component documents the intentions of the parties, for example, it is unlikely that the admission of pre-contractual negotiations will be appropriate, as the risk that these negotiations do not reflect the final position of the parties is greatly increased. Depending on the extent and content of the natural language component of the contract, there may also be an increased risk that third parties could rely on this natural language component to their detriment.

For completeness, where a smart contract consists of a natural language agreement with automated performance by code, evidence of the parties’ pre-contractual interactions should be considered inadmissible in the usual way—novel legal considerations do not arise in this context.

Question 30

Please share your views below:
About you

What is your name?

Name: 

What is the name of your organisation?

Enter the name of your organisation :

The Society of Licensed Conveyancers

Are you responding to this consultation in a personal capacity or on behalf of your organisation?

Response on behalf of organisation

If other, please state::

What is your email address?

Email:

What is your telephone number?

Telephone number:

Chapter 2: What is a smart contract?

Question 1

Please share your views below:

We are only concerned about contracts relating to the transfer of property and land.

Question 2

Please share your views below::

Agreed as a smart contract must contain a record of data such as a history of agreed matters, with each party accessing a copy of the ledger, which is updated instantaneously when any data is added to the ledger. It is important that the ledger is not maintained by a central administrator – all changes to the contract must be approved by all parties.

Question 3

Please share your views below::

We appreciate the benefits of permissioned DLT systems as it would be of vital importance to a property transaction that each party provides their identification as being a legitimate party to the transaction before being permitted to “join” the network.

Question 4

Not Answered

Please provide examples of how these forms of smart contract have been used in practice:
We are unable to comment in this respect other than to suggest that we would expect any smart contract relating to the transfer of land and property would incorporate elements of a natural language contract (i.e. Standard Conditions of Sale and agreement of terms such as confirmation of consideration and Completion Date) together with elements of automated performance (i.e. transfer of consideration and redemption of existing charges on the property).

Question 5
Please share your views below:

We are unable to comment in this respect as hybrid smart contracts are not universally adopted in the transfer of property and land.

Question 6
Please share your views below:

As previously advised in question 4, we would expect any smart contract relating to the transfer of land and property to incorporate elements of a natural language contract (i.e. Standard Conditions of Sale and agreement of terms such as confirmation of consideration and Completion Date) together with elements of automated performance (i.e. transfer of consideration and redemption of existing charges on the property).

Question 7
Please share your views below:

We are unable to comment in this respect as we are only concerned about Contracts relating to the transfer of property and land.

Question 8
Please share your views below:

We are unable to comment in this respect until the use of smart contracts in the transfer of property and land are universally adopted by the industry and any benefits and cost savings can be quantified.

Chapter 3: Formation of smart contracts

Question 9
Please share your views below:

The first requirement for the formation of a legally binding contract is an agreement comprising an offer to be bound on specified terms and an acceptance of those terms by the parties.

Any smart contract for the transfer of property and land must contain a record of data agreed by the parties to the transaction, such as a history of agreed matters, i.e. acceptance of deduced title, acceptance of Standard Conditions of Sale, consideration payable and Completion Date before the parties can be committed to the agreement.

Question 10
Please share your views below:

We are unable to comment in this respect as smart contracts are not universally adopted in the transfer of property and land.

Question 11
Please share your views below:

In theory, we agree that offer and acceptance could occur through the operation of autonomous computer programs, provided of course that each party has been appropriately verified as a legitimate party to the transaction and provided that all appropriate terms (typically via natural language negotiations) have been considered and agreed beforehand.

Question 12
Please share your views below:

Such a situation would not occur in the transfer of property and land as each party to the transaction must be appropriately verified as a legitimate party.

Question 13
Please share your views below:

Please see response to Question 12.

Question 14
We would expect that consideration (money paid for the transfer of ownership of property and land) could easily be identified from the terms of the agreement between the parties.

**Question 15**

Please share your views below:

If smart contracts are to be universally adopted for the transfer of property and land, we would expect that all terms of the agreement between the parties to be recorded and confirmed by each party to create certainty.

**Question 16**

Please share your views below:

No and this certainly wouldn’t be the case in the transfer of property and land.

**Question 17**

Please share your views below:

No as the distributed ledger should contain details of all agreed terms of the property/land transaction to evidence that there is a clear intention to create legal relations between the parties.

**Question 18**

Please share your views below:

The Interpretation Act 1978 defines “writing” as including all modes of “representing and reproducing words in a visible form” so in theory and provided that the source code accurately reflects all agreed terms of the property/land transaction, this would satisfy the definition of “writing”. However, we do not have the requisite expertise to offer any professional comment or judgement in relation to such matters.

**Question 19**

Please share your views below:

Where a smart contract consists solely of code, the parties could theoretically sign the contract electronically, e.g. by using a digital signature verification service to authenticate the code.

**Question 20**

Please share your views below:

In theory yes, provided, of course, that the parties to the smart contract have been appropriately verified as a legitimate party to the contract.

**Question 21**

Please share your views below:

Not to our knowledge – concerning the transfer of land and property.

**Question 22**

We believe that provided that the identification verification checks of the parties to a contract can prove beyond all doubt that the person is who they purport to be and that they are a legitimate party to a property transaction, that there should be no formal requirement for their execution of a deed to be witnessed by a third party.

**Chapter 4: Interpretation of smart contracts**

**Question 23**

Please share your views below:

We do not envisage any such difficulties in this respect as we would expect all terms of the agreement between the parties to be clearly recorded and confirmed by each party to create certainty.

**Question 24**

Please share your views below:
We do not envisage any such difficulties in this respect as we would expect all terms of the agreement between the parties to be clearly recorded and confirmed by each party to create certainty.

Question 25

Please share your views below:

Reasonable person.

Question 26

Please share your views below:

We believe that any coded terms of a smart contract relating to the transfer of land and property should only be performed once agreement to all terms have been reached between the parties to the contract.

Question 27

Please share your views below:

We believe that the current procedural steps utilised by the Courts to resolve contractual disputes would be suitable in this respect. However, we appreciate that there may be some requirement for expert advice in relation to the interpretation of coded terms of a smart contract if such terms are disputed by the parties.

Question 28

Please share your views below:

We cannot comment in this respect other than to reiterate that we would expect all terms of the agreement between the parties to be clearly recorded and confirmed by each party before the smart contract can be performed.

Question 29

Please share your views below:

We believe that such consideration could lead to unintended consequences so we would expect all terms of the agreement between the parties to be clearly recorded and confirmed by each party before the smart contract can be performed.

Question 30

Please share your views below:

We do not foresee any such problems in this respect, provided of course, that all of the terms of the agreement between the parties are clearly recorded and confirmed by each party.

Chapter 5: Remedies and smart contracts

Question 31

Please share your views below:

We do not foresee any such problems in this respect, provided of course, that the terms of the contract do not accurately reflect the parties’ agreement and the terms of such rectification are clearly agreed by the parties.

Question 32

Please share your views below:

We appreciate that as “mistake” has a narrow scope under English law that it may be difficult to establish “mistake” in a smart contracting context. However, where both parties are mistaken about a matter relevant to the code’s execution we believe that the “mistake” should only render the contract void if it makes performance of the contract or achievement of the contractual purpose impossible. That the “mistake” renders performance of the contract significantly more onerous for one of the parties is not sufficient.

Question 33

Please share your views below:

We are unable to comment in this respect other than to reiterate that we would expect any smart contract relating to the transfer of land and property would incorporate elements of a natural language contract (i.e. Standard Conditions of Sale and agreement of terms such as confirmation of consideration and Completion Date) together with elements of automated performance (i.e. transfer of consideration and redemption of existing charges on the property).

Question 34
Possibly. We understand that where one party is mistaken about the code’s execution, the mistake will only render the contract void if the mistake relates to a term of the contract and one of the parties to the contract knew of the mistake at the time of contracting. A mistake about the circumstances surrounding the executing of the code, even if known to one of the parties will not be sufficient to void the contract. The mistake must relate to a term of the contract. We appreciate that difficulties may arise in proving a party’s knowledge of a mistake where a smart contract is entered into by computer programs on the parties’ behalf so the legal principles may need to be adapted in this respect.

Question 35

Please share your views below:

We do not anticipate any difficulties in this respect as a contract is voidable if a party is induced to enter the contract (smart or otherwise) by a misrepresentation made by the other party. We believe that whether a party made a misrepresentation, which induced the other party to enter into a smart contract, can be determined by applying the existing law.

Question 36

Please share your views below:

We do not anticipate any difficulties in this respect and believe that the existing law principles adequately cover such matters.

Question 37

Please share your views below:

We do not anticipate any difficulties in this respect if damages are deemed to be an adequate form of recompense for a Breach of Contract in such circumstances. The court could identify the benefits transferred by the code under the void contract, value those benefits in monetary terms and then order the parties to make restitution to the value of those benefits.

Question 38

Please share your views below:

We do not anticipate any difficulties in this respect and believe that the existing law principles adequately cover such matters.

Question 39

Please share your views below:

We do not anticipate any difficulties in this respect and believe that the existing law principles adequately cover such matters. For example, if the code is merely a tool used by the parties to perform their obligations under a natural language contract, then a party may be liable for breach of the natural language contract if the code fails to perform those obligations correctly. In such circumstances, the party in breach may have to pay damages under the existing law principles to place the other party in the position they would have been in had the code executed correctly. In certain circumstances, Specific Performance may be available if damages are inadequate and a Court could order the party in breach to deploy a new piece of code, which corrects the defective execution of the old piece of code.

Question 40

Please share your views below:

We appreciate that there is a risk that events beyond the parties’ control may affect the execution of the smart contract code. For example, there may be a system breakdown on the platform on which the code is deployed, which means that the code cannot execute or that the code executes in a different way than the parties anticipated. That said, we believe that such risks could be dealt with by including a “force majeure” provision in the agreed contractual terms between the parties, identifying a range of events that might affect the performance of the contract, specifying their effect on the contract and the remedies available to the parties in those circumstances. In such a scenario, the question of frustration will not be reached because the consequences of the subsequent event will be governed by the “force majeure” provision.

Question 41

Please share your views below:

Please see response to Question 40 for such an example – “force majeure” provisions.

Question 42

Please share your views below:

It is vitally important that each party to a smart contract is appropriately verified as a legitimate party. We acknowledge that some smart contracts and distributed ledger technology systems enable the parties to transact using pseudonyms, without disclosing their real identities, but such instances should not apply to the transfer of land and property.
Chapter 6: Consumers and smart contracts

Question 43

Please share your views below:

We are unable to comment in this respect as smart contracts are not universally adopted in the transfer of property and land.

Question 44

Please share your views below:

We are unable to comment in this respect at the present time.

Question 45

Please share your views below:

We agree that a particular challenge will be that consumers may be required to agree to a service provider’s standard terms and conditions without understanding some or any of what they are asked to agree to because they do not understand the computer code. We appreciate that there are already some statutory requirements for service providers to ensure that terms of a consumer contract are “transparent” and unfair terms are unenforceable, but where the terms of a smart contract are wholly or partly in code, the service provider may have to consider taking further steps to comply with these requirements, e.g. providing specific pre-contractual guidance to explain coded terms and conditions or including a natural language element in the smart contract, which sets out the terms and conditions in detail.

Question 46

Please share your views below:

Please see response to Question 45.

Chapter 7: Jurisdiction and smart contracts

Question 47

Please share your views below:

We do not envisage any difficulties in this respect in relation to the transfer of land and property in England and Wales.

Question 48

Please share your views below:

We are unable to comment. We are only concerned with smart contracts relating to the transfer of land and property in England and Wales.

Question 49

Please share your views below:

We are unable to comment. We are only concerned with smart contracts relating to the transfer of land and property in England and Wales.

Question 50

Please share your views below:

We are unable to comment. We are only concerned with smart contracts relating to the transfer of land and property in England and Wales.

Question 51

Please share your views below:

We are unable to comment. We are only concerned with smart contracts relating to the transfer of land and property in England and Wales.

Question 52

Please share your views below:

We are unable to comment. We are only concerned with smart contracts relating to the transfer of land and property in England and Wales.
Please share your views below:

We are unable to comment. We are only concerned with smart contracts relating to the transfer of land and property in England and Wales.

Question 54

Please share your views below:

We are unable to comment. We are only concerned with smart contracts relating to the transfer of land and property in England and Wales.

Question 55

Please share your views below:

We are unable to comment. We are only concerned with smart contracts relating to the transfer of land and property in England and Wales.

Chapter 8: Final questions

Question 56

Please share your views below:

We believe that the issues of “chain transactions” and integration with third parties (mortgage lenders) require further consideration and how smart contracts will operate in such instances, i.e. where the contract cannot be performed until an action has been completed by a third party – monetary payments received and made.

Question 57

Please share your views below:

We are unable to comment. We are only concerned with smart contracts relating to the transfer of land and property in England and Wales.

Question 58

Please share your views below:

Only as identified in this response at the present time.
STEP response to the Law Commission call for evidence on smart contracts

About Us

STEP is the worldwide professional association for those advising families across generations. We help people understand the issues families face in this area and promote best practice, professional integrity and education to our members.

Today we have over 22,000 members in over 100 countries and over 8,000 members in the UK. Our membership is drawn from a range of professions, including lawyers, accountants and other specialists. Our members help families plan for their futures: from drafting a will or advising family businesses, to helping international families and protecting vulnerable family members.

We take a leading role in explaining our members’ views and expertise to governments, tax authorities, regulators and the public. We work with governments and regulatory authorities to examine the likely impact of any proposed changes, providing technical advice and support and responding to consultations.

Purpose of the Paper

In this paper, STEP makes a submission in response to the Law Commission call for evidence on smart contracts as part of the scoping study into smart contracts, which were published on 17 December 2020.

Response

1. Bilingual contacts have two languages set side by side in a contract, with usually one language being the stronger one in case of dispute. Similarly, a smart contact can be prepared with the written real world agreement on one side, and on the other side, the code of the smart contract.

2. However, not every smart contract will be accompanied by comprehensive legal terms. In the same way as how when a trust deed is silent in a particular area then we can rely on the provisions of the governing trust law, there should be an underlying legal foundation that can be referred to for smart contacts. Potentially English law, if clear and commercially appropriate, can become the underlying smart contract law that everyone can rely on and that can handle smart contract disputes.

   Question 9: In what ways can parties reach an agreement through their interactions on a distributed ledger?

3. This will depend on the type of transaction that is being undertaken.
Cryptocurrency transfer

4. Here the agreement is made off chain and the blockchain provides a mechanism for the discharge of the obligation to transfer the cryptoasset. So, if Alice agrees to sell 1 ETH to Bob for £1,300, Bob must provide his consideration in money and Alice will instruct her wallet or custodian to send 1 ETH to Bob.

Coin offerings

5. Here, again, the agreement is made off-chain, although in a more automated fashion. If there is an initial coin offering, generally the person seeking to acquire the new tokens will connect a crypto wallet to the system, describe how much is being spent and then the tokens may or may not be available for delivery. This is an offer by the purchaser to buy the tokens, which might be accepted by the issuer. Provided the purchaser satisfies certain criteria, for instance as to residence or nationality and as to identity, the offer can then be made and will generally be successful, without the intervention of any human.

Simple conditional flow

6. The earliest smart contracts imposed conditions on transfers of cryptoassets. For instance, a smart contract for the sale of a train ticket will transfer a coded right to travel of a train if 0.1 is transferred to the address of a contract account. If Alice transfers 1 ETH to that address, the contract will run in the EVM and the ticket will be sent to Alice’s wallet to be shown to the appropriate machine at the gate to the train's platform. Here there is an offer, by the train company, to use its smart contract to purchase a ticket and transferring the cryptoasset is the acceptance.

Decentralised Autonomous Organisations

7. These systems might be permissioned or permissionless and the nature of the agreement will depend on how it is structured. There is more than one aspect to the agreement. The first important system was known as The DAO, which was a crowd funding set of smart contracts but the model has been followed, with variations, and is popular as a governing body for automatic business systems running on other smart contracts on the blockchain.

8. With The DAO, ETH was to be sent to the address of a smart contract account on the Ethereum blockchain and DAO tokens were to be issued in return. There were no limitations placed on the number of tokens to be created and offered by the smart contracts and anyone was eligible to purchase them, so long as they transferred ETH to the smart contract. All of the ETH raised in the offering was pooled in an Ethereum blockchain address for use in funding projects that were approved by the members.

8.1. The advertising materials of The DAO (in a "white paper") described the structure of the system and provided the source code that would run on the EVM of the Ethereum blockchain. In a document entitled "Explanation of terms and disclaimer" it was stated that:

"The terms of The DAO Creation are set forth in the smart contract code existing on the Ethereum blockchain at 0xbb9bc244d798123fde783fccc1c72d3bb8c189413."
Nothing in this explanation of terms or in any other document or communication may modify or add any additional obligations or guarantees beyond those set forth in The DAO’s code.

"When you click the “I Accept” button or check box presented with the terms you are agreeing that you are taking part in The DAO’s Creation under the terms set forth in The DAO’s smart contract code at your own risk.

"By Creating DAO tokens through interaction with The DAO’s smart contract code, you expressly agree to all of the terms and conditions set forth in that code."

The code was not written in formal legal terms and it is suggested that the agreement was contained in the way in which the system operated, as discovered from an evaluation of the code; the parties agreed to that structure and operation.

8.2. Even if the code of the smart contracts was capable to constitute the terms and conditions of the operation of the system, it is suggested that those operated on-chain and would not have affected the formation of the agreement between vendor and purchaser before a contract was made and that an offer by the promoter, Slock.it, was accepted by a purchaser transferring ETH to the relevant smart contract address. Even though a purchaser could be identified only by their Ethereum blockchain address pseudonym, it is suggested that this would not affect the validity of the contract, and any difficulty would arise only if legal action was to be taken against the purchaser, but that was unlikely to be an issue because he would have had to pay the price before receiving the tokens.

8.3. It is suggested that a further aspect of the agreement between the parties, as determined from the operation of the system, was that the DAO holders were carrying on a business in common with a view to profit, within sections 1 and 2 of the Partnership Act 1890 with all the implied terms of that Act, insofar as they were not excluded by the words of, or the implications to be drawn from, the code (see section 19 of the Act). Some modern DAOs are incorporated (for instance The LAO).

DeFi protocols

9. A DeFi protocol generally operates by offering to apply certain defined and predetermined processes to cryptoassets that are transferred by a user to the protocol system. This might be a return of income or capital or an exchange for some other cryptoasset. The aim of the promoters of these protocols is to use automated processes, including the payment of a reward for depositing value or taking a fee for extracting value.

9.1. It is arguable that there is no counterparty to the deposit or extraction, which occur automatically with predictable results.

9.2. Another argument is that there are two parties to a transaction: the user and the controller of the protocol. Even protocols that are running without any intermediary in the process are subject to the adjustment of their operations. This adjustment is carried out on the instructions of a DAO controlled by its members according to the
value of their holding of the DAO tokens. Their involvement in the transaction will depend on the structure of the DAO, whether it be a partnership or a company.

**Uniswap and other Automated Market Makers**

10. In cryptoasset exchanges that were common until recently, the exchanges of cryptoassets operate as market makers in an order book system, buying and selling on their own accounts and thus providing liquidity for trades. Automated Market Makers operate a system under which holders of cryptoassets deposit two or more types of cryptoassets to provide liquidity pools in those assets, collecting a fee for doing so, and persons wanting to exchange tokens send their tokens to a smart contract, which interact with the liquidity pool and calculate the rate at which the exchange will be made. The smart contracts cannot be altered and so, either there is no counterparty to someone exchanging a cryptoasset, or it is the collection of persons who have contributed to that pool.

11. One of the questions is what happens when someone deposits tokens into a liquidity pool. It is suggested that those tokens are merged into a fund that is held proportionately for the liquidity providers and the trustees of that fund are the liquidity providers themselves. The alternative argument is that they are converted into some kind of debt, like a bank account, but the identity of the debtor is problematical.

**Non Fungible Token purchases**

12. Whereas cryptoassets are generally fungible, in that one token is interchangeable for another of the same type, developers are now creating tokens that are non-fungible and represent something else that is tied to the token on the blockchain. The most common examples of these non-fungible tokens (NFTs) are in the form of digital art, where the original artwork can be seen only with a wallet-like program and ownership (or control, or possession) can be proved by reference to the blockchain. The aspiration is for BFTs to represent real-world items, such as motor cars and houses, with the trick being to tie the tangible asset to the token so that ownership can be proved without reference to sale and purchase documentation.

13. NFTs can be sold by individuals by transferring the tokens using the blockchain, in the usual way, and in such cases the agreement will be off-chain, between buyer and seller. Generally, however, NFT artwork is sold through web businesses acting as art galleries, displaying renderings of the artworks and inviting offers. Here, the agreement is between agency and buyer and the agent will have a separate agreement with the seller.

**Question 22:** Do you consider that a deed recorded partly or wholly in code can satisfy the statutory formality requirements applicable to deeds and address the implications of the Mercury decision?

14. For an instrument to be a deed, it must make clear on its face that it is intended to be a deed and be validly executed as a deed (Law of Property (Miscellaneous Provisions) Act 1989, s.1(2)). If it is being executed by an individual, it must be signed by him in the presence of a witness who attests the signature and be delivered as a deed (s.1(3)).
15. In the Mercury case, the issue before the court was whether there were any reasonable grounds to suspect tax fraud in the carrying out of a tax avoidance scheme. Part of the fraud alleged by the Commissioner of Revenue and Customs were that documents had been signed by clients in draft and the signature pages had been transferred to the final versions, containing different details. On the question of the allegations relating to signature, Underhill J said that there was a common understanding among the parties that the document would exist as a discreet physical entity, whether in a single version or a series of counterparts, at the moment of signing.

16. We take as an example an electronic document in a file containing natural language content relating to the transaction in question (including intention). Passing this file to a smart contract that records the file on the blockchain will be initiated by the user clicking a representation of a button in his wallet software and it is suggested that such an action could be interpreted as the signing of the document. After the file has been sent to the smart contract, there is no on-chain signing; the smart contract takes the file and runs, using the file as its input data. It is suggested, however, that there are the following difficulties:

16.1. It is arguable that the file written to the blockchain is not the document signed by the person executing the deed. It is a copy. We do not think that this is a correct argument; the original stored in the wallet that was sent to the smart contract was what was signed.

16.2. The question of proper attestation is, however, more substantial. Once the smart contract has run, a copy of the original file has been stored on the blockchain. If the witness sends another copy of the file to the smart contract, after pressing the usual button, that does not constitute an attestation of the original. Attestation requires the witness to be present at the signing and then to sign a statement on the deed to that effect (see per Sir J Romilly, MR in Wickham v Marquis of Bath (1865-66) LR 1 Eq 17, at 24). It also falls foul of the Mercury decision.

16.3. Delivery might also be a problem. The file stored on the blockchain is not the original, so delivery of it (by some other code in the smart contract) cannot be considered to be delivery of the deed.

17. Whereas with a contract a copy may be as good as an original, a deed on the other hand is a separate beast, with the power to bind parties without consideration, and therefore has a number of formalities. It would seem a stretch to say that the current smart contract protocols resemble that. A smart contract code could sit alongside a deed that somehow meets the main formalities (i.e. calls itself a deed and is signed and witnessed) or potentially the code could be constructed to resemble a deed, although we have not seen a smart contract like that yet.

**Question 56:** Are there any issues we should be considering on smart contracts beyond those we discuss and ask about in this call for evidence?
18. STEP believes that the Law Commission should also consider the legal position around smart contracts in circumstances involving death, incapacity, and potential trusts.

**Smart Contacts and Death**

19. Where a person enters into a smart contract that meets the definition of a contract in English law, but dies before the contract executes, the ordinary rules of contract law will apply. If the deceased person’s estate is still bound by the legal contract, then (provided the smart contract accurately gives effect to the terms of the legal contract) there is no reason why the smart contract should not execute.

20. However, the position is different where no legal contract exists, as in cases where no consideration is provided. For example, Alice sets up a smart contract whereby upon registration of Alice’s death, 10 Ether tokens are transferred from Alice to Bob. Bob has provided no consideration, and Alice has not executed a deed, nor is Bob otherwise due to inherit under Alice’s existing Will or intestacy.

21. Possible legal analyses of the situation could include:

   21.1. The smart contract serving as a Will or Codicil – this would not be possible given the current requirements of the Wills Act 1837, but if the law were changed to permit electronic Wills, or to include a dispensing power (as the Law Commission is considering in another project) this might become relevant.

   21.2. Considering the gift already complete, based on the principle in Re Rose [1952] 1 All ER 1217 that Alice had done all that she could to transfer the tokens – however, as she never intended to make a lifetime gift of the tokens to Bob, it is not clear that this could apply.

   21.3. Donatio mortis causa – provided Alice was acting in contemplation of impending death when she set up the smart contract, Bob could argue that it was a donatio mortis causa, although he would have to argue that the smart contract could be considered a constructive delivery of the tokens to him.

   21.4. Unjust enrichment/resulting trust – if Bob is not able to prove any of the alternative analyses apply, then Alice’s personal representatives may be obliged to recover the Ether tokens on behalf of the estate, by means either of a claim for restitution for unjust enrichment, or that Bob holds the tokens on a resulting trust for the estate.

**Smart Contracts and Incapacity**

22. Similar considerations are relevant in cases of incapacity. Again, the problem does not arise in cases where the incapacitated person has entered into a genuine legal contract, which would still be binding on them despite subsequent incapacity. The problem would arise where a person has created a smart contract to part with tokens at some future point without consideration (or a supporting deed), and then loses capacity such that at the point the smart contract is to be executed, they no longer have the capacity to make such a gift.
23. In such a situation, the recipient might try to argue that the gift was completed while the donor still had capacity to make it, as described above, but otherwise the donor’s attorney or deputy might be obliged to recover the tokens from the recipient.

Smart Contacts and Trusts

24. There does not appear to be any reason in principle why trustees of an existing settlement could not enter into a smart contract if they thought it was in the interests of the settlement. However, it is possible to imagine situations where smart contracts might be used in novel ways where trust law is arguably relevant.

25. For example, Alice transfers 10 Ether tokens to an address known only to Alice’s smart contact program, which has been set up to transfer the currency to Bob if Bob is living on Bob’s 21st birthday, or else to Carol. Has Alice made a gift at the point she sets up the smart contract, or only once it executes? This could be relevant for various tax purposes.

26. There could potentially be a trust in such circumstances: the 10 Ether tokens would be the trust property, and the terms of the smart contract code might be drafted so as to provide all the certainty needed for a trust. However, there are no trustees. Possibly Alice might be considered a trustee, if she is still alive, or else the Court might exercise its jurisdiction to appoint a trustee. There would still be a problem though in that any ‘trustee’ in these circumstances would have no actual control over the trust fund. For example, if an Inheritance Tax charge was to arise on the tenth anniversary of the smart contract’s creation, the Trustees would have no means by which to pay the tax liability out of the trust funds.

27. Of course, it is also possible to imagine other situations where a smart contract is drafted much more like a conventional trust, giving a trustee the necessary powers in practice to properly administer it, and in such cases there would seem to be no problem with the trust having been embodied in and implemented via a smart contract.

Conclusion

28. STEP therefore believe that the Law Commission should take this opportunity to consider how smart contracts fit in to the law concerning death, incapacity and trusts. These are not purely hypothetical concerns, since fintech companies are already seeking to become involved in the business of inheritance (e.g. https://safehaven.io/). STEP, and in particular the Digital Assets Global Special Interest Group that brings together thought leaders in this field, will be happy to assist further should the Law Commission wish to pursue these points.
Chapter 2: What is a smart contract?

Question 1

Please share your views below:

Contractual obligations which are both precise and clearly structured (in order to be capable of being automated using computer programs/code) - for example, an obligation to calculate an interest payment due under a loan(s) and report it to parties under a loan agreement.

There was a useful article titled 'Computable Contracts' by Harry Surden that was written in 2012 on this topic which may also be useful here: http://lawreview.law.ucdavis.edu/issues/46/2/Articles/46-2_Surden.pdf

Question 2

Please share your views below:

If technology companies are developing smart contract systems that run on technology other than DLT, then I think it would make sense to understand:

(i) what those alternatives are;
(ii) how prevalent they are or might become; and
(iii) how they differ to running smart contracts on DLT systems.

Ultimately, in order to help businesses adapt to smart contracts, I think that lawyers will need to understand:

(i) how the contracts they are drafting and negotiating are converted into code/a smart contract;
(ii) how the performance of coded obligations and preservation/enforcement of rights works under that technology;
(iii) how smart contracts run on DLT interact with smart contracts run on other technology (for example, would a non DLT system increase or reduce performance
risk under a contract);

(iv) the limitations of these systems not only in creating smart contracts, but also throughout the contract lifecycle (for example how amendments and waivers to smart contracts can be effected and how contracts can be terminated);

(v) how smart contracts on DLT and non DLT systems would be capable of interacting with one another.

That would help with the smooth adoption of these technologies and help to educate and better inform users of these systems.

In addition to the DAML articles highlighted at footnotes 101-103 of the Law Commission's Call for Evidence, there was an interesting article written in 2019 titled ‘To DLT, or not to DLT? That is not the question' which also looked at DAML: https://medium.com/daml-driven/to-dlt-or-not-to-dlt-that-is-not-the-question-887e9f17e3fe

Question 3

Please share your views below:

Parties may want to use permissioned systems:

- to ensure confidentiality and for security reasons.

- to provide the ability for parties in different permissioned systems to interact with one another (for example, a financing agreement in one system might want to talk to a supply contract in another system to obtain/monitor performance metrics under the supply contract for the purposes of monitoring covenants under the financing agreement),

therefore providing potential for greater business efficiencies.

Parties may want to use permissionless systems for transparency reasons if there are lots of users - however, that would need to be weighed up against security risks.

Question 4

Natural language contract with automated performance

Please provide examples of how these forms of smart contract have been used in practice:

I have no working knowledge of this, albeit I'm aware of a smart contract provider who allows the contract to be produced using natural language with any coding/automated performance sitting behind that.

Question 5

Please share your views below:

I have no working knowledge, albeit this is an area that I think those drafting/negotiating contracts will need to understand more to enable commercial terms to be coded/written correctly.

Question 6

Please share your views below:

As someone who would want to be able to draft/negotiate a smart contract in the future, in order to plan to negotiate, draft or enter into any types of these smart contracts, I think that as with a paper contract, parties will need to understand how that contract actually hangs together from a commercial perspective first before the technology piece, because parties will need to have the confidence that what they have bargained for is actually followed through and represented in the smart /hybrid/code only contract.

The types of questions that I would consider before putting together a smart contract would include:

(i) what is the obligation(s) I wish to automate and whether there is any interplay between (1) those obligations, (2) those obligations and any non coded terms, (3) those obligations and the terms of any other contract that may impact or be affected by those obligations;

(ii) how does the 'on paper' obligation become a 'coded' obligation? What is the translation process? Do I need to understand that language to understand whether the obligation has been correctly represented in code? If not, who would talk me through that process?

(iii) is the coded obligation the same as the on paper obligation and does it have the same effect? Coders may need to explain to lawyers how obligations become 'alive' in a smart contract context and how both the smart contract code and the DLT systems effect that;

(iv) what is the place of performance of that obligation from the coder's perspective/smart contract technology provider's perspective (e.g. is it in the cloud/where the server for that cloud is located etc.)- this may be important to know for illegality purposes or in case performance in a specific jurisdiction triggers an unwanted tax liability - if this can't be ascertained, continuing with the smart contract might be problematic;
(v) whether and in what circumstances the performance of an automated obligation might need to be waived and how that would be dealt with within the smart contract;

(vi) if some obligations/rights are in the smart contract and some are still on a normal paper contract, is there any hierarchy that applies (e.g. in the event of any conflict between the smart contract part and the paper contract part, which prevails and can something be written in)? Would that hierarchy be respected if the subordinated obligation is in a smart contract?

(vii) how are any confidentiality and data protection considerations (whether contractual, or at law) dealt with (e.g. understanding how the mechanics of the DLT and smart contract preserve confidentiality);

(viii) whether the contract in question needs to interact with any other contract (for example an intercreditor agreement) and how overriding rights and obligations in other contracts would be respected where a contract affected by the intercreditor is a smart contract/hybrid;

(ix) understanding where liability sits if the code/software/systems fail, there is a security breach, or data is compromised. For example, should computer coders/software hold indemnity insurance for these types of issues, if that is in fact something that insurers would be willing to provide?

(x) understanding how the dispute mechanics work and how they would achieve a speedy resolution to any disputes under a smart contract, bearing in mind any cross border elements and whether local laws are advanced enough to deal adequately with smart contract disputes;

(xi) understanding whether in order to operate the smart contract, any costs are incurred via the platform (for example is there an 'Ether' or 'Bitcoin' cost for effecting an obligation in a smart contract and recording it in a ledger - where would liability sit for that, who would need to be in funds in Ether/Bitcoin to effect the transaction and what would happen if there was no available Ether/Bitcoin to effect the transaction?

(xii) prevailing language - if a smart contract has been reduced to code from an English contract, does the smart code translation or the English version prevail (this is a similar question to when say a Spanish law security document is written both in Spanish and English, but the Spanish version prevails).

**Question 7**

Please share your views below::

I wonder whether smart contract technology could ultimately be used to perform checks on security registers/at the courts immediately before smart contracts conclude and obligations become live (e.g. checking via DLT technology whether a company has any existing outstanding charges that could prejudice a lender, registered at Companies House, or whether there are any insolvency entries on the CE-File at the High Court ).

i.e. The smart contract is programmed to perform the checks via a system that talks between the smart contract and the relevant registry and prevents the contract from being entered into/funds being released along the chain if there are any adverse entries.

That would both give greater certainty to parties that solvency/charges checks are as up to date as possible and if the design of the system was built in a way where it could also flag any pending applications received by a registry, but not yet processed and registered on the register/CE-File, that could add in further layers of protection.

**Question 8**

Please share your views below::

Benefits:

(i) Speed of execution (because obligations are performed in the smart contract, rather than through human intervention);

(ii) The ability for parties to have a single central store of information/documentation relevant to the smart contract (i.e. no need to email reporting information around);

(iii) The ability for multi party consent/waiver processes to be run through the smart contract (e.g. in a syndicate of 200 lenders, lenders could indicate their consent via the smart contract software which could effect the relevant waiver/consent in the smart contract, without the need for lenders to confirm to the facility agent first, or the facility agent to confirm to the borrower group).

(iv) Cheaper for simple contracts with non-complex obligations

Additional costs:

(i) It may add transaction cost to begin with as people get familiar with the technology - if an explanation of what the code does and how it interacts with other contracts/systems needs to be explained to a board of directors for the purposes of decision making, that could add to costs too.

(ii) Query whether dispute costs and the availability of enough people qualified to opine on smart contract disputes could initially make enforcement costs more expensive - e.g. the cost of understanding the smart contract from a dispute perspective pre-any court/arbitration hearing could require a translation of the code/expert assistance, the cost of which might be prohibitive for some parties - however, over time, education and greater tech skills/awareness would help to overcome this.

(iii) Query the difficulties from a cross-border transaction perspective - e.g. would it add to the costs of legal opinions, or result in heavily qualified opinions? However, these teething issues have already been seen in the e-signature and signing-platform space and I see no reason why they couldn't be overcome in
principal, if there is full market collaboration.

(iv) As mentioned in my response to question 6, there may be a Bitcoin/Ether cost to record the smart contract/obligations/performance on the DLT. Given the current rising US Dollar price of cryptocurrencies, any currency risk in any Bitcoin/Ether cost may need to be considered where parties intend to use smart contract technology for mass contracts.

(v) Also query whether indemnity insurance may be required to cover system errors/programming errors where third party smart contract software is used and/or those third party providers are involved in the creation of the contract, what that cost might be and whether that would provide adequate cover.

**Chapter 3: Formation of smart contracts**

**Question 9**

Please share your views below:

Apologies, I have no practical experience of this.

**Question 10**

Please share your views below:

None that I'm aware of.

**Question 11**

Please share your views below:

If the parameters under which (i) the offer can be made and (ii) acceptance can be given are in each case precise and unambiguous, then in theory, parties could 'delegate' their ability to make and accept offers to the smart contract, so that the smart contract makes and accept offers on their behalf via the agreed coded parameters.

This assumes the DLT is actually capable of effecting such offers and acceptances. This also assumes that there are no corporate law/constitutional restrictions that would not allow actions to be delegated in this way - however, for example, the model articles for private companies limited by shares say at para 5(1)(b)

"Subject to the articles, the directors may delegate any of the powers which are conferred on them under the articles...by such means (including by power of attorney)...as they think fit".

This appears to pave the way for directors to delegate the acts of 'offering' and 'accepting', to smart contracts and computer code.

However, the parties would need to understand what they were letting themselves in for from a commercial perspective and where any need to override the smart contract was needed, a smart contract might not be the appropriate mode of contract to use.

Also query whether the contractual basis on which this arrangement takes place could ever give rise to any type of agreement to agree?

**Question 12**

Please share your views below:

Apologies, I have no working knowledge of this.

**Question 13**

Please share your views below:

Query whether a court could seek evidence of identity of the parties through disclosure via the smart contract/DLT provider or via some sort of numerical identifier/key?

**Question 14**

Please share your views below:

Not in principle. However, in practice, I would want to understand from the smart contract technology provider, the process around how the smart contract works in order to understand the time and manner in which consideration flows from the promisee & who it actually flows to on the DLT.

**Question 15**

Please share your views below:

As mentioned in an earlier response, as long as the 'on paper' obligation is clear and unambiguous and translates into the same obligation in the smart contract, then the completeness of the obligation should be evident.
In circumstances where contracts or multi-contract arrangements are partly in a smart contract environment, thought would be needed as to how the smart contract obligations interact with ‘on paper’ obligations/rights and vice versa.

This will particularly be the case if obligations in a smart contract are ‘irreversible’, but overarching agreements provide provisos, limitations or caveats around performance of those obligations. I suspect this may be something that lawyers will have to fathom out and find workarounds for over time, but advancements in technology/understanding smart contract systems more may ultimately provide us with workable solutions, as more contracts move into the smart contract space.

Question 16

Please share your views below:

No

Question 17

Please share your views below:

There may be difficulties if the underlying code is ambiguous/doesn't function or the legal relationship that the smart contract purports to put in place is unclear.

From a practical perspective, there would need to be a clear roadmap to effecting what the parties had agreed in their minds, to translating it to the smart contract and distributed ledger. However, in theory, this is no different to putting a contract on paper, as parties would be doing themselves a disservice by entering into contracts they new they couldn't perform at day one.

Conversely, if the nature and scope of the obligations and transactions to be performed are clear and unambiguous and can actually be performed by the distributed ledger and smart contract, then I foresee fewer difficulties.

Question 18

Please share your views below:

The Interpretation Act 1978 refers to typing, printing, lithography, photography and other modes of representing or reproducing 'words' in a visible form.

Given the Interpretation Act doesn't say that 'words' have to necessarily be in any particular language, then I think that source code to the extent it is written in words/letters could meet the definition.

However, if any of the source code is numerical or contains symbols and the effect of those numbers and symbols affects the ordinary meaning of that code when understood from an English language/other natural language perspective, then source code might not meet the definition of 'writing' (but that conclusion may be solely because we have never had to think about interpreting source code language in the past). It certainly wouldn't harm to have this clarified in law if the majority consensus is one of ambiguity here.

Question 19

Please share your views below:

I've never seen this in practice and would want to understand how the 'intention to authenticate' comes about and is 'written' on the coded contract before being able to reach a safe conclusion.

Question 20

Please share your views below:

I haven't seen this in practice, but given that eIDAS type compliant signatures already have an element of entrusted technology behind them, perhaps there is a way in which smart contract providers and signature platform/electronic signature providers would be able to collaborate in order for the technology to be able to talk to one another and imprint the signature onto the smart contract (or record the signatures on the DLT) via an internet of things type arrangement.

Question 21

Please share your views below:

No

Question 22

Please share your views below:

For deeds which are currently capable of being concluded by electronic means (e.g. remotely using pdf completion), then as long as the parts of the deed recorded partly and wholly in code can be disseminated and interpreted in a clear and unambiguous way and do not conflict with any part of the deed which is not in code, then the terms of the deed would be clear - assuming that code is also 'writing' for the purposes of the Interpretation Act 1978, then on the face of it, a requirement for a deed to be 'in writing' should be satisfied unless there is a requirement for the deed to be signed in wet ink on a physical piece of paper.

Regarding statutory requirements for execution, some electronic signing platforms already operate in a way whereby a digital representation of the signatory's
signature is embedded into an electronic version of a deed, by the signatory creating a 'specimen signature' and then agreeing to affix it into the electronic document next to their name (rather than physically signing their signature on screen into the document with a stylus).

Once executed, the signed document returns to the signing platform’s cloud server. The signing platform may show a final representation of that signed deed on screen by clicking the document link and the platform may also typically allow the final executed deed to be downloaded into a pdf version. Deeds are often created this way in practice where permissible and this practice has grown as a result of the Coronavirus pandemic which has accelerated the use of signing platforms.

If a signing platform could ‘speak’/‘interact’ with a smart contract platform, then in theory, it may be possible for a signatory to execute a smart contract deed by signing in the signing platform and for that signature to be embedded into the smart contract to create a valid deed. However, if the contract is partly coded and partly natural language, then query whether it is actually possible for the signature to be made on the ‘deed as a whole’ or whether in essence, what you actually have is two deeds - one coded and one natural language?

However, there may be other practical difficulties here depending on the complexity of the deeds - for example, board level approval of deeds by Companies - if directors need to understand what they are signing and all/part of the deed is in code, they would need some means of ensuring that they understood the legal effect of what they were signing up to in order to comply with their directors’ duties under the Companies Act 2006. Also, for registration purposes, if deeds were completely/partly in code, Registrars may need a system whereby they can translate and understand the terms of the code to check whether it is fit for registration.

Contrast that with witnessing, where the witness doesn’t need to understand the terms of the document, but needs to observe it being witnessed - witnesses may need some certainty around what they have actually signed in order to be comfortable and usual data protection and confidentiality considerations also come into mind here - i.e. where and how would witness information be visible on a DLT and who could that information be shared with?

Ultimately overcoming any residual issues from this question and addressing Mercury type issues would benefit from closer collaboration between technology companies in the smart contract space and other interested parties, so that any limitations in the technology are understood and any changes to the law on deeds fits in with how the technology works in practice.

Chapter 4: Interpretation of smart contracts

Question 23

Please share your views below::

I think the contract would need to be clear as to which component (coded or natural language) would prevail in the event of a dispute (or which parts of the coded contract would prevail). There may need to be some translation of the code to evidence this in the underlying natural language.

Query whether there might be circumstances where parties forget to put some of the terms into code, or there is a security/technical reason that causes the code to malfunction - there might need to be an English language ‘single back up version of the truth’ which acts as a master copy of the contract to resolve interpretation issues under existing English law principles.

Question 24

Please share your views below::

Where the terms of the code are ambiguous/incomplete or the ordinary meaning of the code can't be established by (i) looking at the code, or (ii) translating the code into an understandable English/natural language version.

Contracts qualified by reasonableness, material adverse effect, consent, or other qualifiers which currently create legal ambiguity in the paper contract space may be similarly difficult from an interpretation perspective in the smart contract space.

Question 25

Please share your views below:

I think that a coding expert with knowledge of how the code & code software in question works would need to explain the literal meaning and function of what the coded term actually did/said in plain English. An English court could then analyse what the coded term meant in accordance with normal English law principles.

Query whether an expert in DLT or any underlying cryptoasset the smart contract interacts with, might also be needed to determine the effect of the code as a whole and how it interacts with the blockchain/cryptoasset on a practical level.

Question 26

Please share your views below::

Apologies, I have no practical experience of this.

Question 27

Please share your views below::
1. Understand the steps that led to the coded terms being incorporated into the contract (including pre-contractual negotiations);

2. Obtain a plain English interpretation of the coded terms from a coding expert familiar with systems of that nature.

3. If the position was still unclear, understand whether the coding/input into the smart contract or the negotiation created the interpretation issue.

**Question 28**

*Please share your views below:*

Apologies, I have no experience of this.

**Question 29**

*Please share your views below:*

In situations where there isn’t an agreed form natural language version of the coded contract that backs up the smart contract and the smart contract malfunctions, is compromised, or does something that a party claims it never intended to do/didn’t agree to.

**Question 30**

*Please share your views below:*

Not as long as there are enough available and experienced subject matter experts who can help the courts understand smart contracts/associated DLT systems in a way that would allow them to resolve disputes effectively.

Problems may arise if the evidence of a subject matter expert is challenged or there are different views on the interpretation of a piece of code or how the DLT works - query whether some sort of coding /DLT arbiter body could help this though.

**Chapter 5: Remedies and smart contracts**

**Question 31**

*Please share your views below:*

This may ultimately depend on the complexity of the transaction and how easy it is to rectify in the smart contract/on the DLT. In practice with paper contracts, many mistakes are purely typographical in error and easy to fix as they rarely actually affect the underlying contractual obligation.

I think the main issues will arise where parties don’t really understand the effect of the smart contract coded terms and the smart contract effects something that wasn’t intended. However, there may be practical safeguards that can be developed to avoid this from happening (e.g. smart contract English language translations/visual on screen English language version of the underlying coded contract).

**Question 32**

*Please share your views below:*

No, and I think in practice, the parties would want to be comfortable that the smart contract mirrored their intention at the outset (e.g. by using a smart contract platform that provided an equivalent English language on screen).

**Question 33**

*Please share your views below:*

Apologies, I have no practical experience of this.

**Question 34**

*Please share your views below:*

1. (i) From a practical perspective, I think that a party would need to understand the circumstances in which a smart contract/computer program could conclude a contract/perform an obligation in order to assess whether there might be any possibility of any type of mistake in the first place;

   (ii) If there was a unilateral mistake in the coded contract, it feels like that would arise because one of the English language terms of the contract is not reduced into the smart contract correctly - e.g. there is a coding error (in which case, the current legal principles on unilateral mistake would probably assist);

   (iii) However, if the effect of that unilateral mistake had broader consequences (for example, it performance of the mistaken obligation then triggered the performance of an obligation under another smart contract, when that wasn't the intention), query whether the legal principles on unilateral mistake would need to be widened to provide remedies for inadvertent automatic performance arising in consequence of a unilateral mistake, or whether other existing legal remedies would be sufficient.

Ultimately, a computer program will perform what it is programmed to do and a layperson not know whether a unilateral mistake was coded in at the outset, nor
what the overall unintended impact would or might be.

2. The non-mistaken party knew the mistaken party was mistaken and that mistake was actually reduced to code in the smart contract. If the unilateral mistake is not reduced to code and there is no mistake in the code, then I don't think that either party are prejudiced.

Question 35

Please share your views below:

No

Question 36

Please share your views below:

In practice, I think that a party will need to be live to the potential risks of not being able to unwind a smart contract in a way that puts it back into its original position.

I think that parties may ultimately have to take a commercial view on whether the inability to obtain ‘perfect’ restitution would be problematic for them and weigh that up against being able to obtain a satisfactory monetary equivalent remedy instead.

This may ultimately also depend on the type of transaction/underlying asset(s) in question and the level of perceived credit risk on the contract counterparty at day one of the contract. Underlying pre-contract commercial and legal due diligence may also mitigate misrepresentation risk (as it does today on paper contracts).

Question 37

Please share your views below:

I think the practical difficulty here is that parties to a coded or part coded contract will not want to be responsible for a breach caused by malfunction/unintended consequences of the computer code, because it is something which is likely to be outside of their control.

If a party enters into a contract and that party’s authority is in effect, delegated to the smart contract code to automatically perform the contract and the smart contract then breaches the contract, query whether that ‘delegated authority’ has been exceeded by the smart contract (which once the smart contract goes live, is effectively outside of the party’s actual control), or by the party to the contract?

Ultimately, I think the contractual relationship between the contract parties and the party who provides the smart contract software could be important here and if a breach of contract damages claim is successful, parties would want to look to the software/technology provider for recourse. Commercially, this may be problematic - for example, if the technology provider:

(i) doesn't owe any duty of care to the party the damages claim has been successful against (e.g. where only one of the parties 'holds the pen' on drafting/coding the smart contract);
(ii) doesn't have deep pockets; and/or
(iii) doesn't have indemnity insurance of an adequate level to cover these sorts of risks (particularly on high value transactions).

Additionally, if the code malfunction is due to a cyber attack outside of the software/technology provider's control, then a remedy may not be legally available to the contract counterparty and the only recourse might be by way of insurance (if actually available and in any event, subject to any exclusions in the insurance policy).

Question 38

Please share your views below:

I agree with the Call for Evidence paper - parties may ultimately need to find some sort of technology override, but how that override operates and what it actually does might need to be considered on a transaction by transaction basis.

Question 39

Please share your views below:

I think the difficulties are similar to those outlined in my response to Question 37, i.e. in practice, parties would need to consider who they would ultimately have recourse to if a breach of contract was caused through either mis-coding the original smart contract, or through there being a bug or security hack of the underlying software/DLT system - i.e. the risks that might flow from allowing a smart contract to do things for a party autonomously would need to weighed up, rather than necessitating a change in the law per se.

Question 40

Please share your views below:
From a practical perspective, if a party (or its lawyers) has 'held the pen' on creating the smart contract and the smart contract system provider has performed an update on the system which causes an error and leads to a frustration event which the party who held the pen wishes to rely on, then query whether under the principles in the case of Lauritzen (J) AS v Wijsmuller BV, The Super Servant Two, that party would be able to successfully plead frustration if it could be shown that party was at blame or at fault with the update? i.e. could a party be held to be at fault if it has in essence delegated its authority to perform the contract to the smart contract system/smart contract provider?

Question 41

Please share your views below:

I haven't yet seen any terms used in practice yet. However, it may be that in practice, there isn't a one size fits all here and provisions may need to be carefully drafted on a case by case basis to reflect:

(i) the actual technology being used;

(ii) what level of control (if any, the parties have on that technology);

(iii) who 'holds the pen' on the drafting - e.g. if the smart contract is written using the smart contract software available to one party, parties may need to consider what level of liability it is acceptable to exclude if that software develops a bug/ is flawed - e.g. should the party who chose the system/held the pen be absolved of liability?

(iv) whether the smart contract is part of, speaks to, or interacts with other smart contracts on a blockchain - e.g. what rights including third party rights (if any) would a person have if disruption to one smart contract on a DLT system caused loss under another smart contract?

(v) whether technology providers are joined into smart contracts as parties, so that other parties can pursue the smart contract provider if loss is suffered due to the negligence/breach of contract of the smart contract provider.

Question 42

Please share your views below:

I agree with the concerns and restitution claim solutions highlighted in the Call for Evidence. Ultimately, depending on the number of smart contracts (and cryptoassets) affected by illegality and the actual ability to reverse smart contract transactions on a DLT, it may be difficult to apply both the illegality doctrine and actually unwind the transaction.

Difficulties might be able to be mitigated to some extent if smart contract service providers are obliged by law to prevent their code from effecting named types of illegal transactions, albeit that would need to be carefully considered on a transaction by transaction basis - ultimately, flaws in a piece of coding or a cyber-security breach may result in an illegal transaction outside of the control of the smart contract provider.

Chapter 6: Consumers and smart contracts

Question 43

Please share your views below:

No

Question 44

Please share your views below:

Over the next 24 to 36 months

Question 45

Please share your views below:

Query whether any right for a consumer to withdraw their consent under a consumer contract, or crystallise the benefit of a cooling off period might be problematic if a consumer contract is concluded wholly or partly in code (i.e. query how the smart contract would actually give effect to that in practice).

Question 46

Please share your views below:

Consumers will need to understand the terms of any coded contract in natural language, otherwise unless they see the code, understand the code and understand what other interactions that code might have with systems/other contracts and how it would perform, I don't think a consumer could be confident in knowing what they have signed up to.

I think there would also need to be a set of standards around how natural language versions of coded contracts are provided and their accuracy, so that consumers can have confidence in them.
There may also need to be careful consideration of how any consumer smart contract interacts with other systems, particularly in the robotics/internet of things space where smart contracts are given agency to do things under a consumer contract. I think there would need to be full transparency on what permissions/actions that could gives rise to and that consumers are fully aware of the consequential actions that might be carried out on the consumer's behalf, or which the consumer might be subject to, under a coded contract.

Consumers will also need to be able to reach an informed decision around any data sharing consents when interacting with coded contracts. To ensure that UK GDPR and other data protection laws are respected, consumer contract providers may need to think carefully about the ecosystem on which any consumer smart contract lives or might interact with, to ensure that there is full transparency when requesting consumer consent and so that a consumer knows who might be able to see their personal data on a DLT ecosystem if they provide consent.

Chapter 7: Jurisdiction and smart contracts

Question 47

Please share your views below:

Query in instances where the contract is formed wholly in code, where the place of formation is - if concluded via computer program, query whether the smart contract is concluded 'in the cloud', at the geographic location of the computer server or another location.

Also, in instances where a contract is hybrid and concluded partly in code and partly in traditional form, query what the place of formation is if the human accepting the offer is in one geographic location, but the rest of the contract is concluded in the cloud/at the location of the server in another country.

One possible solution might be for the parties to elect a place of formation in a contract for the avoidance of doubt, but that might have to be carefully considered, particularly if it bears no relation to where the parties/signatories are at the time of the contract being formed, or creates a conflict in law.

Question 48

Please share your views below:

I think this will ultimately depend on the precise contractual relationship between the party and the smart contract software provider, bearing in mind that in practice, it may be a law firm who is drafting the smart contract using the smart contract provider's software, or using the services of the smart contract provider to code the contract.

If the smart contract provider is deemed to be an agent and it is only that smart contract provider who facilitates the completion of the smart contract for both parties, and only Party A's lawyers draft and conclude the smart contract via the smart contract software, there is an argument that the smart contract provider as facilitator of the smart contract for Party A may be Party A's agent, depending on the terms of any agreements between them. However, it feels unlikely that the smart contract provider could be agent for both parties to a contract, unless it has agreed that.

Question 49

Please share your views below:

If the platform's protocol is sufficiently certain to provide clear and unambiguous rules, then in principle it is something which could govern arrangements.

However, query whether that could become problematic in circumstances where the national state laws of the parties conflict with the protocol rules or the protocol rules fall into the territory of illegality.

It may be that a contractual override provision could assist here to deal with conflicts, but on the basis that a coded contract may automatically conclude matters autonomously, query the practical use/effectiveness of that type of override.

Question 50

Please share your views below:

It feels conceivable that this could be done, but I haven't seen any practical examples of this.

Question 51

Please share your views below:

I agree that the location of the nodes/server could be a factor.

The jurisdiction of the party who instigates the creation of the underlying smart contract might be another factor as long as that is traceable, or could be 'stamped' in some way onto the blockchain - that assumes that one party (or its lawyers) 'hold the pen' on the creation of the smart contract coding and would be akin to say one set of English lawyers being responsible for drafting and finalising a specific English law paper contract or a French lawyer drafting and finalising a specific French law paper contract.

Question 52
Please share your views below:

None that I'm aware of.

Question 53

Please share your views below:

I think it is problematic for the reasons that have been stated in the Call for Evidence.

Question 54

Please share your views below:

Those mentioned in para 7.82 of the Call for Evidence

Question 55

Please share your views below:

Those rules which are connected to identifying a location within the distributed ledger/smart contract technology itself, as it may be difficult to identify a geographic location in the true sense of the word.

Yes, I agree with the analysis of issues as described.

Chapter 8: Final questions

Question 56

Please share your views below:

If a smart contract goes wrong and a party suffers irrecoverable loss due to a deliberate security breach of the distributed ledger or smart contract, query whether existing laws are adequate both in terms of criminal penalties for the perpetrator and the ability of the party who has suffered loss to be compensated by the criminal, a compensation fund (or otherwise).

Question 57

Please share your views below:

I think that jurisdictions who are involved in the wider technology space would be useful to look at in terms of both development of smart contract use and development of laws (or lack thereof) in relation to smart contracts and DLT technology - for example:

- Australia
- Belgium
- Brazil
- Cayman Islands
- China
- France
- Germany
- Gibraltar
- Hong Kong
- Japan
- Liechtenstein
- Luxembourg
- Malaysia
- Mexico
- Portugal
- Russia
- Singapore
- Switzerland
- UK
- USA

Question 58

Please share your views below:

Clarification around the law of deeds to allow smart deeds to be created with confidence in addition to smart contracts.
Response to the call for evidence on Smart contracts
To: smart-contracts@lawcommission.gov.uk

To Whom it May Concern,

Following your publication of the UKJT’s Legal Statement on cryptoassets and smart contracts in November 2019, and the subsequent action to undertake a scoping study into the law on smart contracts we are delighted to offer our contribution to the study by responding to some of the questions you asked.

Trakti https://www.trakti.com/ is an innovative UK startup offering a unified platform for smart, self-executing and compliant contracts running on both private and public blockchain, streamlining the contracting process of medium-large enterprises, financial, insurance and regulated market operators. Trakti offers all the tools needed to securely streamline the acquisition and negotiation flows, and manage all corporate contracts in a unique infrastructure. Our objective of Trakti is to assist companies during their innovation journey from the beginning right up to the signing and monitoring of the contract in a fully compliant way thanks to the usage of smart legal contract.

Considering all the experience gained in the field during the last four years, and all the lesson learned in applying smart contract in the market, we decided to contribute and to offer our point of view and insights on how smart contracts and smart legal contracts are used and applied in the real word.

Kind Regards

Trakti Ltd.
Response to the call for evidence on Smart contracts

1) What kinds of contractual obligations can currently be automated using computer programs? Please provide specific examples where possible.

Currently smart contracts are best suited to execute automatically two types of obligations found in many contracts: (1) ensuring the transfer of funds upon certain triggering events and (2) imposing financial penalties if certain objective conditions are not satisfied.

Smart contracts are also used to delivery/exchange tokens or digitalise goods (e.g., unlock a car or a room, transfer non fungible tokens, like digital art).

By using smart contracts is possible to adapt prices according to the objective or perceived quality of the service.

Smart contracts are also deployed to hold assets, which will be released on when pre-programme conditions are fulfilled.

2) Do you agree that the Law Commission’s scoping study on smart contracts should be limited to contracts which use distributed ledger technology? If not, please provide details of other technologies which are used to support smart contracts, and their prevalence.

In 2.3 the smart contract definition specifies “a computer program which runs automatically”. Then in 2.4 the study scope is set to “smart contracts deployed in a distributed ledger technology”. According to us, the “smart contract” should not be limited to DLT but should be a digital form of a contact which can be understood by a machine as specified in the 2.3.

3) When, and why, do parties to smart contracts decide to use: (1) permissioned DLT systems?

Permissioned DLT systems are usually used among industry-level enterprises and businesses, for which privacy and security is relevant, access to data have to be restricted and identification of parties, immutability and transparency are common values and institutional trust is in part in assured: supply chain, food tracking, internal voting, research, bank and payments. This solution represents the right choice if you need: governance structure (this means that they are organized. Administrators/Validators, with qualified voting, control and governance structure in place, require less time to update the rules over the network), private transactions, authentication process, fast output, scalable network, energy efficiency. Furthermore, stakeholders can customize the networks based on their requirements and they can choose their own consensus method and do not need every node for validation purposes.

(2) permissionless DLT systems?

This approach works in an open environment such as peer-to-peer cash, fundraising and digital identity, supply chain traceability, record-keeping.

This solution is gaining traction as a foundation for business-to-consumer (B2C) and consumer-to-consumer (C2C) use cases.
Transparency, unlike permissioned blockchain, is paramount; permissionless blockchains are also good when it comes to incentivizing the users in the network. They can be used for the betterment of the participants as it brings transparency and trust to the whole network.

4) Which of the three forms of smart contract discussed in para 2.32 of the call for evidence are most commonly used in existing smart contracts or smart contracts which are in development? Please provide examples of how these forms of smart contract have been used in practice.

The third form of smart contract is most commonly used especially in the crypto market. The actual tasks that smart contracts are performing are fairly rudimentary, such as automatically moving an amount of crypto currency from one party’s wallet to another when certain criteria are satisfied. As the adoption of blockchain spreads, and as more assets are tokenized or go “on chain,” smart contracts will become increasingly complex and capable of handling sophisticated transactions. With the advent of DeFi, we are witness of the fact that programmatic functions are becoming more sophisticated but also unstable and nebulous.

In the enterprise market we see an increasing adoption of Smart legal contracts an hybrid model where the legal prose, the parameters and the code are combined together in clear and compliant way that is human readable and transparent. We believe this approach is more likely to be adopted and although there is the attempt to use a hybridisation of the computer language with the legal one to create Markup forms and Domain Specific Languages that could bridge the gap between the two worlds, we have experienced usability issues that combined with the missing IT skills in the sector could generate problems and blockages in the adoption, both from a legal and from an operational point of view.

5) How do code and natural language interact in hybrid smart contracts currently in existence or in development and which terms are generally coded?

Smart contracts function as a program that connects to a natural language contract through an addendum that establishes an inviolable link between the program and a natural language contract.

The negotiation takes place in a classic way, no peculiarities are recognized. The contract drafting phase is different. The operational clause that will be implemented by the code must be parameterized. That means that the smart legal template is composed by three elements: legal prose, parameters and code. Parties use the template to accommodate their terms and conditions, fill up the parameters and in the end, they sign the agreement by e-signature. The execution parameters are extracted from the legal prose and passed to the smart contract code that provides automated execution. Sometimes the value of a parameter might be provided by an oracle (i.e., interest rate) or by the use of IoT that is provided from a trusted source of data and is available to the code while it is running. It is possible for a parameter to be defined in one document, given a value in a second document and used in a third document. The identification of a parameter entails identification of its name, value, type.

The smart contract, when the pre-defined conditions set up by the parties are met, starts to run and to execute the payments. Generally, the operation clauses are implemented by code: e.g., single or recurring payments or deliveries of digital goods or digitalized goods.
7) Are you aware of any examples of use cases for smart contracts beyond those we give in the call for evidence, or variations on the use cases we give, which are being developed, are at proof-of-concept stage or are already operational?

1) Digital Services SLA Monitoring (B2B)
Monitor Outsourcing teams or Digital Services is a complicated task that requires a lot of background work and reporting. In most of the cases SLAs monitoring controlling that service provisioning meet a minimum level of service with limited attention on service detriment since the monitoring and sampling in most of the cases is controlled with spot checks.
In a modern world where we are capable to control the service provisioning digitally SLAs should respond to real time monitoring and control and contracts should automatically perform a number of automated daily monitoring cycles to check compliance and service improvement.
For a client in the automotive sector, we have been working on the implementation of Smart Legal Contract on an Ethereum blockchain, to monitor the execution of a cloud IT service with agreed KPIs and parametric prices that would assign a penalty for low performances, the agreed fee in case of agreed performances or a bonus in case of higher performances. Oracles are use to collect measure of the IT service from a KPI dashboard. The drop or increase of the fee is directly linked to the certified delta between the weighted average of all the measures collected in a billing cycle and the agreed target in the contract.
Furthermore, the contract has been designed to end automatically in case of performance lower that 30% of the agreed target.

2) Food Supply Chain monitoring and production certification (B2B2C)
There are several pilots running using blockchain to track and trace food production in a shared ledger of records and to demonstrate the chain of custody of perishable goods.
But there is also much more than this, we are currently working in Italy in the certification of production lots, that should be evaluated against the guidebook, procedures, and regulation applicable to that sector avoiding the possibility for product replacement, overproduction and overall counterfeiting or food products.
The selected DLT (Ethereum) record the evidence of all the assets used, operations, actions and the overall context that generated that lot/product and evaluate it against the rulebook/directive or even contract published and/or signed by all parties.
Based on the rules and contract signed with the customer, the product or lot gets an instant certificate that is the sum of all the collected evidence (in case of transformation can evolve over time) and the value of the contract will change based on the final score of the product traded/assigned, since the value is determined by the grade assigned during the production cycle and the transformation in the entire supply chain.

3) Maintenance and Logistics (B2B)
Smart legal contracts can also be used to automate the controls connected to planned maintenance of physical assets of high value that require a full control on the parts replaced or controlled, the person in charge of the operations, the successful check on the activities performed and the registered proof of all the authorisations obtained after the maintenance.
In this context, we have been working in the avionic sector on an Ethereum based private infrastructure to tokenise all assets, register all the actions performed (including the videos
proving the activities), register the results of the technical tests performed and collect all the signed authorisations obtained after each operation.

The activities are referring to logistic and handling services to be completed within a specific time interval, agreed in a service contract, following the opening of a ticket by the client and performed by a trusted external provider in charge of all maintenance and logistic operations. Each part replaced and monitored is registered and logged in the DLT and is used also by the regulator authority to retrieve the trusted logs of all the maintenance as specified in the product configuration and certification guide. The Smart Legal Contract following the rules and configurations will check if the operations have been following the right procedure within the specified time windows and using only certified and registered/approved parts. In this case have been automated the clauses relating to “Service Provider’s Obligation” and “Operating records and report”.

8) What benefits and cost savings can smart contracts provide compared with traditional contracts? Will increased use of smart contracts lead to any additional costs? Please provide details and any available qualitative and quantitative evidence.

Benefit: smart contract is unable to refuse to act, to omit a condition or to fail. Smart contract is recorded and cannot be altered. There is no room in a smart contract for discretion. They are like exchanges promised. There is no room for doubt that the rights and obligations correspond to the actions undertaken by the code: the code is those actions: clarity with regard to the parties’ intent is increased by the reduction of language ambiguity and vagueness because the language of a smart contract code require specific date (e.g., location and time need to be explicit), a plain language, non-conflicted contract terms, and an outcome-based approach which incentivize the logic.

Furthermore: no need to monitor the execution, no arbitrary delay, no mishandling of the transaction, enabling payment verification and tracking.

The smart contract allows to detect, record data, verify compliance with the parameters established in the contract and generate subsequent contractual states: it can vary the price of the goods in case of violation of the parameters set by the parties, or trigger the right to terminate the agreement or the creation of legal interests.

In verifying the non-fulfilment of the parties, the smart contract automatically activates the resolution mechanisms established ex ante by the parties. This feature makes the relationship more certain and calculable, and eliminates the need to send warnings, notifications and the like.

Another advantage deriving from smart contracts is the possibility to ascertain in real time the events that cause financial imbalances between contractual services/performances. Once the event has been detected, the smart contract can automatically bring the contract back to equity.

In this way reaction and negotiation times are reduced, disputes are reduced and legal certainty increases. The contract becomes dynamic and flexible to the objective and not merely arbitrary changes of the parties.

Costs: Blockchain-based smart contracts can also offer reduced transaction costs through stateful computation. Although a blockchain may require a payment to run a smart contract, depending on the smart contract and blockchain, these costs may be small in comparison to the amount traditionally spent on transfer fees, third-party agent fees, commissions, and escrow accounts. Smart contracts reduce the costs of people having to calculate complicated outcomes: contracts-for-difference, are an example where software very rapidly and continually adjusts balances and can dispense cash flows based on frequently updated market prices.
9) In what ways can parties reach an agreement through their interactions on a distributed ledger?
There are two parts in the interaction point, (i) interaction between two parties who invokes the function/logic of a smart contract and produces a result, (ii) a consensus mechanism in the distributed ledger which validates and allows to add the result in the ledger.

The initiator wishing to participate in a smart contract hosted on a permissionless blockchain can:
- Download the software from publicly available sources;
- Create an account using the software (it will create a key pair-public & private key). The user has to securely store the private key because if it is lost, there is no way to recover it.

If the initiator wishes to trigger a smart contract transaction on the relevant ledger, it uses its address to send an initiating message, encrypted with its private key, to the other participants.

10) Are you aware of programming languages which are specifically designed to enable parties to reach agreement on a distributed ledger? If possible, please give examples of the circumstances in which they could be or have been used.
In general, DLT comes with the concept of smart contract to provide such type of functionality and Solidity is an example of language developed for smart contract in Ethereum blockchain.

12) How common is it for parties to enter into smart contracts on a DLT system without knowing each other’s real identities and in what circumstances is this likely to arise?
It is common in online platforms where user uses smart contract without knowing each other identity. Currently NFT related platforms became popular.

13) What evidence might be available to a court to establish the identity of the parties to a smart contract entered into pseudonymously on a DLT system?
It is not possible to find the identity of a party as there is no real information about a person/entity in permissionless DLT. Only known information is the public address. But analysing transactions from/to an address it might be possible to find more detail about an address, for example if an address received some tokens from a crypto exchange, the exchanger will be able to provide information about the person who sent the tokens. This information might help to identify the owner of the address who received the token.

15) Are you aware of, or do you foresee, any difficulties in determining whether the parties to a smart contract have reached a certain and complete agreement? If possible, please provide examples.

Smart contracts are focused on the execution stage of the agreements. There are quite a few things that need to occur before one even gets to an execution stage: e.g., identify the parties, agree the subject matter, agree the terms of the deal and meet any anti-money laundering requirements. Smart contracts lead to an increasing significance of the contract drafting phase, so in case of commercial smart legal contracts we do not see any difficulties in determining whether the parties have reached a complete agreement.
18) Do you consider that source code could meet the definition of “writing” in the Interpretation Act 1978?

Source code is a human-readable text written in a specific programming language. The goal of the source code is to set exact rules and specifications for the computer that can be translated into the machine’s language. Programmers lay out all of the rules for a computer-executable application. The source code of a program is also copyright protected. Just like with other intellectual property rights. Given this definition of source code, we would say that the source code meets the definition of “writing”, specifying in the Interpretation Act above.

19) Do you consider that parties can “sign” an agreement recorded solely in code?

In a DLT when a user is doing any operation, it has to digitally sign the input data with his private key. So digitally signing process is one of the primary building blocks in any DLT system.

26) Do you consider that performance of the coded terms of a smart contract cannot always be predicted based on a reading of the code? If so, can you provide examples or specific evidence of this occurring?

Has a smart contract is a piece of code which computes a logic on input and provides an output, by reading the code it is possible to understand the logic but the output of the logic completely depends on the input and the output will vary based on the input.

27) What practical or procedural steps could the courts take to resolve disputes about the interpretation of the coded terms of a smart contract?

The courts should primarily approach the interpretation exercise by asking what the language of the contract would have meant to a coder expert. If the doubt about the meaning persist, courts could investigate:
- what the common intention of the parties was, evaluating their overall behaviour, even after the conclusion of the smart contract. Interpretation is not the historical reconstruction of the parties’ will, but what appears objectively wanted;
- verify what was the purpose of the parties;
- attribute the most convenient meaning to the nature and object of the operation.

Using objective interpretation criteria, privilege the solution that gives the smart contract a meaning that allows it to have some effect rather than a meaning that would not allow it to have any. Finally, take into account the uses, what is generally practiced in the place where the smart contract was concluded.

31) Are you aware of, or do you foresee, any practical difficulties in ordering rectification of the coded terms of a smart contract? If so, do you think that parties to a smart contract will, in practice, seek rectification?

On truly immutable blockchains, a smart contract cannot be removed or altered once deployed. In such cases, to create an effect similar to modifying a smart contract the parties must use a workaround.
If a smart contract has been fully performed by code, rectification is itself futile. In this case, the claimant can ask for deploying a new smart contract (novation) with the necessary alterations at a new address, “killing” or “self-destructing” the original one. Compensation remedy is also an alternative.

In a different scenario, where the code is still running (e.g., recurring payment) the claimant can modify/amend the smart contract using a multi sig wallet where a list of party must agree and sign to update it. However, this type of remedy work only with upgradable smart contract. Furthermore, a smart contract can be programmed to “call” and run the code of another smart contract to implement a smart contract structure at the outset that enables the redirection of a master smart contract’s call to an erroneous smart contract to an alternate smart contract. It may be possible to programme a smart contract to fix mistakes with minimal human intervention if the smart contract is connected to and interact with electronic registers of assets, bank account.

33) What steps or precautions (if any) do parties typically take before entering into a smart contract to satisfy themselves that the code will execute as intended?

Parties might take two steps in order to make sure that the code will run as intended:
- testing and simulating in a test environment the behaviour of the smart contract code to ensure it has no errors;
- validating the behaviour of the smart contract code to ensure that it is faithful to the meaning of the contract.

35) Are you aware of, or do you foresee, any difficulties in applying the existing law to determine whether a smart contract has been entered into as a result of a misrepresentation?

In case of misrepresentation the claimant has the power to rescind the contract and the court may award remedies to restore the parties to the position they were in before the contract was made.

As usual we have to take into account different scenarios:
1) In case the code is still running the court can order:
- to stop it;
- the restitution of payments, if any, made by the code, to the claimant. Payments can be made off chain or by ordering to deploy a new smart contract.

In any case the transaction and all its changes will always be available on the blockchain, cause the impossibility to remove them.

2) If a smart contract has been fully performed by code, reverse the transaction to put the parties into their original position is not possible. In fact, this can happen only if the smart contract has been implemented with a separate logic to do another transaction to put the state back at a certain stage. But that logic must be present before deploying the contract.

In this case the court can order the re-transfer of the sums or goods to the claimant party off chain or award an appropriate amount of compensation.

An additional problem that could prevent from recreating the situation prior to the contract is the possibility that the defendant has transferred the asset (that was the subject of a prior rescind transaction) to a third party. In this case could be difficult to identify the latter party and ask for the restitution of the asset.
37) Are you aware of, or do you foresee, any difficulties in awarding damages for breach of contract where the terms of a natural language contract are performed automatically by computer code?

In addition to typical indemnity clauses, the parties should include in the governing traditional contract provisions to address smart contracts specifically. For example, indemnities protecting the parties that did not code the smart contract with respect to damages resulting from improper operation of the smart contract or from other errors in the smart contract. Mutual or more nuanced indemnities may be required where both parties to a transaction collaborate in drafting, reviewing, and testing the smart contract.

Parties entering hybrid smart contracts should determine whether their existing insurance covers smart contracts and related issues.

38) Are you aware of, or do you foresee, any difficulties in applying the legal principles concerning termination where the terms of a natural language contract are performed automatically by computer code?

This completely depends on how the smart contract is implemented. There is no built-in termination logic in smart contract language. The developer has to implement the logic and enforce access control on who can trigger the termination.

40) Are you aware of, or do you foresee, any difficulties in applying the law on frustration to smart contracts?

Another important question for parties is how they can resolve the case where the smart contract can be frustrated as a result of technical deficiencies on the platform or unforeseeable events in the smart contract environment.

In such events parties might include in the natural language the provision of a reversion to a traditional contract system, where feasible.

41) Can you provide examples of terms that parties have included (or might include) in the natural language element of the smart contract to address the risk that subsequent events might affect the performance of the code?

In case of technology failure or errors that might affect the performance, parties can kill or self-destruct the smart contract (if provided for), agree to no longer abide by the smart contract and execute the performance in a classical way.

For clarity, parties should include in the traditional contract a general statement that, despite any results of a smart contract running, the smart contract’s purpose is limited to carrying out the intent of the traditional contract and, if running the smart contract results in an inconsistent result, then the parties will cooperate in good faith to carry out the intent of the parties embodied in the traditional contract.

In order to reduce the risks of programming errors, it would be necessary to include into the smart contract code the possibility of reversing transactions, for example with the aid of a programmed arbitration board.
50) Can an express choice of applicable law be embodied in computer code? If possible, please provide any practical examples of a coded clause expressing a choice of applicable law.

In a code an attribute/property can be set by stating what is the applicable law but it is just an information. The code cannot do anything with it as still it is not possible to make a computer system to learn legal system.

56) Are there any issues we should be considering on smart contracts beyond those we discuss and ask about in this call for evidence?
One issue to be considered is the burden of proof for smart contracts. The automated execution can lead to a reversal of the burden of proof. Smart contracts may shift the burden of claim and proof between two or more contracting parties. Certain types of parties may be less able to assume such risk.
Response of Transpact.com to Law Commission call for evidence on smart contracts

Dear Law Commission,


I am writing on behalf of my firm, Transpact.com (the trading name of Anpa Forward Ltd). We are currently Europe’s leading payment escrow firm.

**Escrow**

Escrow is another name for conditional payment, or another name for a form of smart contract. Our service exists as a simple three step process:

- Payer and payee agree on the escrow conditions in natural language on our platform that will later determine whether payment goes on to the payee or back to the payer.
- Once agreed, the payer makes payment to our firm.
- Once events have clarified themselves, our firm then makes payment either on to the payee or back to the payer, as set-out in the escrow conditions.

Our service is largely automated and self-running, and requires little manual intervention – most of the work we do as a company is anti-money laundering and counter terrorist-financing checks on the payments and parties going through our systems, and do not need to intervene in any way in the automated process we manage.

We thus to a large extent are already a smart-contract system in largescale operation.

We have struggled legally and regulatory, as our service falls very much ‘between the chairs’. Regulators have tended to look the other way, rather than examine and decide the perimeter issues that our firm in day-to-day practice raises.

So we welcome the Law Commission call for evidence.

**Useful Analogy**

As a useful illustrator comparison to the main issue we face, we often use the following example to illustrate the legal and regulatory difficulty:

It used to believe that we lived in a Newtonian world, where everything in the universe ran in a kind of clockwork and mechanistic and definite way. When we do not known the state of any one piece of information, it was understood that that ignorance only betrayed our lack of knowledge, and everything indeed has a true and definite state, whether known or unknown.

So a cat was either dead or alive.

And a contract was always going to be paid to party A or party B, even if at a certain time...
events that determined that payment had not yet taken place.

We now know that the world that we live in does not operate in this way! The world we live in is actually Quantum, if we look closely enough. So, as in the case of Schrödinger’s cat, it is now known that before anyone checks in on the cat, the cat is actually in a mix of two conflicting states – the cat exists both in an alive state and a dead state with a 50/50 chance that when we do finally check on the cat, the situation will only then crystallise into either a live cat or a dead cat. It is NOT correct to say that the cat is either alive or dead before checking and we do not know which. This is an error, as if it was true then our modern day computers would instantly stop working (hard drives rely on quantum tunnelling, which occurs only because of this concept of the cat being both truly alive and dead at the same time before checking). The magic of the physical reality that we live in – the quantum world – forces us to consider the world very differently.

So it is with our service, and with smart contracts. How should the law and regulators treat our service in the stage where we are holding payment for two parties, but before the events have occurred to make it known who the payment will be made to?

It is tempting to view the situation in a Newtonian way, and say that it was always clear who the payment would be made to, it was just at the time the payment was held we were ignorant to that information, and later when events unfolded our ignorance was removed. This approach is unhelpful (and somewhat arrogant), and we believe wrong.

We believe that it is correct in law to view the situation akin to the true quantum manner, and state that at the time the payment is held (before events have unfolded that clarify the payment’s destination), that the payment is held on behalf of both parties, and in some senses both and neither of them own the payment, each with its own probability. How this is then treated in law is for the Law Commission to establish, but it may be different from current law.

Please note that our service currently deals only in payments and not in other assets or rights. In some way, payments are a purer form of asset, and payment law and treatment may or may not be identical to asset law and treatment. But where we have used the term payment in the analogy above, the term asset or right could equivalently have been used.

With that introduction (which I hope will prove useful), we turn to comment on the Call for Evidence document itself. References below refer to the paragraph in the Call for Evidence – so ‘2.4’ refers to paragraph 2.4 of the Call for Evidence:

2.4: We are also only concerned with smart contracts deployed on a distributed ledger. A distributed ledger is one type of replicated database. A replicated database is a database (a database is simply a ledger) where what should be the same data is held in different places. From a database point of view, a distributed ledger has no advantages nor disadvantages over other forms of replicated database, and we are surprised that the Law Commission should seek to scope
the call for evidence purely to DLT. All the legal aspects of DLT apply equally and more broadly to replicated databases. There seems no reason for the Law Commission to deal only with DLT and not all similar replicated databases.

DLT has become some sort of consultancy buzzword, with consultants raising significant fees from clients by offering the supposed latest ‘must-have’ technology. But in our experience, in these cases, neither the consultants nor the clients really had a deep understand of exactly what DLT is and what it is not, and like other buzzwords interest steadily builds and then suddenly will disappear.

If the Law Commission can come up with a single reason to scope the Call for Evidence only to DLT and not to the slightly wider field of replicated databases, then the Law Commission should stick with DLT only. But we rather suspect that apart from PR, there is no reason to concentrate on DLT only and this is a significant error. Therefore, it is important that the Law Commission examines the matter where it is useful for all replicated databases, and not exclusively DLT (which would be a missed opportunity).

Question 1 - 2.12: What kinds of contractual obligations can currently be automated using computer programs? Please provide specific examples where possible.
Please look into our Transpact.com service, which is a semi-automated service that delivers a smart contract experience now (and has for the past ten years).
It is used to automate any contractual obligation which involves payment (whether goods or services or deposits), with regard to the legal obligation to handle the payment.

2.14: When data is added to the ledger, every node's copy of the ledger is updated instantaneously. Therefore, at any point in time, every node holds an identical and up to date copy of the ledger.
This is wrong. It is a description of idealised DLT.
In practice, DLT works just like every other replicated database, and faces replication timing issues. In fact, much (but not all) of the law around Smart Contracts in future years will revolve around conflicts caused by these timing issues where different nodes are not fully synchronised and hold data in different states.
Even if the timing issues are extremely unlikely (say one in a hundred thousand chance, or a one in ten million chance), when smart contract systems are handling thousands or millions of transactions then these timing-related issues become not only possible but actually frequent.
It is wrong for the Law Commission to write this critical issue of DLT systems (and also of other replicated databases) out of existence by simply assuming it away.

2.15: The distinguishing feature of DLT compared to other shared databases is that the ledger is not maintained by a central administrator.
This is wrong. It is absolutely not a distinguishing feature of DLT. DLT nodes which are all controlled by one authority are identical to other replicated databases under one authority, and yet they are still DLT even though they are controlled by a single administrator.
Conversely, there are replicated databases where different nodes of the database are maintained by autonomous and separate administrators. No central authority maintains the replicated database, and yet the replicated database continues as a replicated database, but not DLT.
The statement is therefore totally incorrect.
2.16: The consensus mechanism is typically designed so that, once data is added to the ledger, the data is very difficult to amend. This is also true of any replicated database with a log, not just DLT.

2.18: This paragraph does not address the problem of timing issues, with different nodes receiving different updates at the same or similar time.

2.18: Once a bitcoin transaction is recorded on the ledger, it cannot, for practical purposes, be amended. This may be true as known at this time, but it is not unlikely that in the next year or next few years quantum computers may be developed to be able to amend DLT at will. The Law Commission needs to factor into law what will occur with respect to DLT linked contracts if and when this occurs. This is too likely to become a reality to be ignored or omitted.

2.19: Security: in a centralised ledger, the central administrator is a “single point of attack”: if the administrator is hacked, then the hacker can gain control of the ledger and tamper with its data. As already pointed out, this is incorrect where a replicated database has nodes operated by different authorities. DLT is no more or less secure than such replicated databases.

2.19: Immutability: as noted above, the consensus mechanism ensures that data, once recorded on the ledger, is very difficult to amend. As already pointed out, this is incorrect where a replicated database has nodes operated by different authorities. DLT is no more or less easy to surreptitiously amend than such replicated databases.

2.19: Efficiency: in a centralised ledger, participants have to rely on a central administrator to maintain and update the ledger. This is perhaps the most egregious mistake and erroneous claim made for DLT. DLT is highly inefficient, and requires levels of electricity and power that can quickly overwhelm nation states. This is not trivial, and a real weakness of DLT. The computational requirements of DLT just cannot be described as ‘efficient’. DLT is much less efficient than other comparable and functionally identical replicated databases.

2.21: Even where the power to make changes to the ledger is centralised or not fully decentralised to all participants, the ledger can still be said to be decentralised, as each node will have an identical copy of the entire ledger. This is the description of all replicated databases, and not only of DLT.

2.23: Smart contracts can be deployed on a distributed ledger so that contractual obligations expressed in computer code are performed by the computers on the network. Our own firm’s services are an example that Smart contracts can be deployed on a replicated databases so that contractual obligations expressed in computer code are performed by the computers on the network – DLT is sufficient but not required, since DLT is a subset of replicated databases.

See also comments below to 7.21.
2.23: These features also mean that parties can transact directly with one another without having to rely on traditional intermediaries such as banks and clearing houses. Our own firm’s services are an example that Smart contracts can be deployed on a replicated databases to do the same – DLT is sufficient but not required, since DLT is a subset of replicated databases.

2.24: However, in these cases, the computer program is subject to the control of one or both of the contracting parties.
This is just not true. If the various copies of a replicated database are held by a different authorities, then the computer program is subject to the control of no one authority, and is identical to DLT in this respect.

2.25: Given the unique benefits of DLT
This should be re-written as ‘Given the unique marketing power of DLT enthusiasts to earn money and gain revenue from promulgating a false theory about the supposed advantages of DLT over replicated databases’.

Question 2 - 2.26: Do you agree that the Law Commission’s scoping study on smart contracts should be limited to contracts which use distributed ledger technology? If not, please provide details of other technologies which are used to support smart contracts, and their prevalence.
No – replicated database are also as necessary to consider from a legal point of view. DLT is just a subset of replicated databases, and everything which holds true of DLT also holds true for replicated databases (DLT is a broad term, as is replicated databases, and both includes examples which do and do not fit into this consultation. But as broad categories, neither should be excluded).

As a further point, there will be times when both parties to a contract will be happy for a third trusted-party to act as the database and smart contract holder and administrator.
If both parties have full trust and confidence in a third party, rather than DLT, then the legal issues of automated smart contracts raised in this consultation will be just as apposite to these cases, as to where the data is held on a DLT database. Such a trusted party might be the UK Government or a large corporation or a committee of selected people.

We would ask the Law Commission to drop the DLT requirement from the consultation, as its inclusion does not achieve anything, and the points of law raised are actually database independent. The Law Commission should not be falling for the latest business fad or craze – law survives fads and crazes.

Question 3 – 2.29 - When, and why, do parties to smart contracts decide to use: (1) permissioned DLT systems. (2) permissionless DLT systems.
This question is broad.
In our own firm’s experience, Smart Contracts are used in a whole host of very different situations, and whether a permissioned or permissionless DLT or replicated system is chosen depends on the underlying circumstances and situation. Because the possible use of Smart Contracts is so large, this question therefore becomes somewhat nonsensical.

2.31: there are five requirements for the formation of a legally enforceable contract. These are: agreement, consideration, certainty and completeness, intention to create legal relations, and compliance with formalities.
We believe that our firm’s existing service meets all five of these criteria.
Question 4 – 2.39 - Which of the three forms of smart contract discussed in para 2.32 of the call for evidence are most commonly used in existing smart contracts or smart contracts which are in development? Please provide examples of how these forms of smart contract have been used in practice.

Our firm’s services can either be described as natural language or hybrid. The external inputs (or Oracles) which crystallise the outcome of a contract (and move from ‘conditional to either party’ to ‘actual for one party’) are all automated.

Question 6 - 2.41 - What process do the parties follow (or plan to follow) in negotiating, drafting and entering into a smart contract?

In our firm’s systems, the systems themselves encourage and facilitate the two parties to negotiate and agree in natural language the terms of the smart contract. This is an important part of our firm’s integral process.

2.45 - According to Ernst & Young, Insurwave enables claims “to be paid in hours rather than years”, premiums to be “agreed and settled in seconds”, and insurers to “track their exposures in near real-time”.

Please note that none of these advantages are due to DLT. DLT is irrelevant in this respect, as the backroom database type used under this product could have been any type of trusted database type to achieve these advantages.

2.46-2.50 - Parametric insurance

This product and its design is very similar in concept to our own product. Please note that our product does not rely on DLT at all, but still is represented perfectly in Smart Contract discussions.

2.58 - and computer programs deployed on the ledger could be used to transfer payments automatically upon the occurrence of certain events in the supply chain (such as a document being signed or goods being delivered).

Already occurring through our firm’s services – that is what we do.

2.61 - Peer to peer sales

This form or DLT, as it is peerless and anonymous, enables and facilitates a major form of trade based money laundering – and should not become mainstream, as Government will require knowledge of the identity of the parties taking part. If it does become mainstream, money-laundering will become impossible to counter.

2.65 - Increased efficiency and lower transaction costs

The increased efficiency and lower transaction costs are due to the Smart Contract design, and are totally independent of the use of DLT.

Smart Contract based on non-DLT databases perform just as beneficially, if not more beneficially.

2.65 - Reduced risk of fraud

Please note the comment in 2.18 – If and as soon as quantum computers are able to crack prime-factoring problems (which may be as soon as next year or in the next decade), the risk of fraud becomes not only significant, but certain.

2.68 - What benefits and cost savings can smart contracts provide compared with traditional contracts?

Smart Contracts provide certainty of performance to the two parties to a contract – if the smart
contract is written up correctly. No other method of contract provides certainty, as all other methods rely on other mechanism to enforce, which can break down or not occur. Whereas the smart contract is itself the enforcement mechanism.

3.4 - **We do not consider that these smart contracts would give rise to any novel legal considerations in identifying an agreement between the parties.**
In our experience, smart contracts do sometimes cause novel legal consideration to apply. This occurs where party A makes an offer to party B (say, but not necessarily, in natural language), and Party B accepts the offer.
Now, in many cases, party A may believe (correctly or incorrectly) that party B’s acceptance does not compel party A to the contract, as party A believes that when it made the offer, it retained the right to itself accept the offered contract and the offer it made was only to see if party B would accept. If party B accepts a smart contract offer, and then puts the offer into effect, we believe it is a point of law that still needs to be established in which circumstances this is considered as party A having accepted the offer that Party A originally made, and the circumstances when it does not (because party A’s offer was not intended as final without party A’s final confirmation). This is of course true with any contract, whether smart or not, but the particular decentralised nature of smart contracts makes the question much more apposite to smart contracts.

3.22 - **Accordingly, users of permissionless DLT systems are said to be ‘pseudonymous’: transacting under a pseudonym (the public address) makes the user difficult, but not impossible, to identify.**
It would be nice if this was true, but it is incorrect.
It may be possible to identify the user of a permissionless DLT system through tracing, but it may equally be impossible. If the user takes proper steps, and uses jurisdictions which do not reveal information, then it is certainly possible for a user to remain fully anonymous. So the ‘but not impossible’ is an incorrect statement. It is disappointing to see this incorrect claim in this call for evidence.

**Question 12 - 3.25 - How common is it for parties to enter into smart contracts on a DLT system without knowing each other’s real identities and in what circumstances is this likely to arise?**
Roughly one quarter of smart contracts that we transact are anonymous, where the two parties do not learn the real identity of the other party.

3.34 - **A piece of code which contains vague or inconsistent instructions, or omits certain essential instructions, will not be performed by a computer. Conversely, code which is expressed with correct syntax and which contains all essential instructions will be performed by a computer.**
As IT developers and users, we are aware that the simplicity of the above statement is somewhat naive and not always correct.
A piece of code is a set of instructions, which is interpreted by a computer and will run on that computer at that time in one way.
But in the real world, unintentionally, it is rare but not uncommon for computer code to run in a different way with different results either on a different computer, or on the same computer at a different time. This makes the assumption made in paragraph 3.34 incorrect, and it is important that this is understood from a legal point of view.
Reasons that the same computer code may unintentionally run differently on different computers or at different times include i) different but similar hardware producing unexpected different behaviour, ii) upgrades to operating systems unintentionally causing the same program now to run differently, iii) upgrades to programming languages unintentionally causing the same program now to run differently, iv) associated data storage changes causing data to be handled differently by a piece of computer code (say, for example, in the treatment of null values), v) etc.

We, along with most programmers and database administrators, have experience all of the above change in behaviour of the same computer code at different times, and on each occasion it has caused significant business problem.

It is not safe for the Law Commission to treat one piece of computer code as always producing the same results. This may be intended, but in the real world there will be rare but many real times when this does not hold true.

**Question 15 - 3.35 - Are you aware of, or do you foresee, any difficulties in determining whether the parties to a smart contract have reached a certain and complete agreement? If possible, please provide examples.**

See comments on 3.34 above. If one party is expecting code to run one way, and another party is expecting code to run a different way, and the code runs differently on different machines across DLT nodes or at different times, then it is possible that an irresolvable conflict may be created.

**Question 17 - 3.51 - Do you foresee any difficulties in ascertaining whether parties intend to create legal relations when they transact with one another on a distributed ledger?**

See comments above to 3.4

**3.76 - However, we concluded that the current law does not support witnessing otherwise than by the witness being physically present when the document is signed.**

But the Government is giving serious consideration to changing the law within current timescales to allow video witnessing of deeds. Indeed, the Land Registry seems to be expecting it in the relatively near future for property transactions. So any legislation planned now should bear this in mind and allow for video witnessing if and when it is brought to statute.

**4.18 - Code which contains a syntactical error will not be recognised by a computer, and code written with correct syntax will have only one meaning to a computer.**

This is not always correct. See comments to 3.34 above.

**Question 26 - 4.31 - Do you consider that performance of the coded terms of a smart contract cannot always be predicted based on a reading of the code? If so, can you provide examples or specific evidence of this occurring?**

See comments to 3.34 above. The answer is that in reality performance of coded terms is not always as predicted, due to the reasons given.

**4.39 - The risk of translation errors is arguably high, given the differences between natural language and computer code.**

It is not just translation errors that are possible.

In the vast majority of coding specifications and instructions we have seen, the specification given to the programmer does not fully specify behaviour in fringe or perimeter circumstances. Programming is as much an art as a science, and whilst different programmers will produce similarly functioning
code based on any specification, it is not unlikely that in fringe or perimeter areas the behaviour of
the code will be different, because the specification produced for the programmer was not
completely specified – it is very difficult (if not near impossible) for non-coders to understand the
depth of specification required for coders, and ambiguous perimeter areas arise from most
specifications not addressing these perimeter areas in sufficient full detail.

4.40 - There are still likely to be natural language interactions which preceded the smart contract
even where the contract itself is expressed solely in code. These could include:

- Why is no mention made of the technical specification of the coding language itself?
The coding language itself is written in semi-natural language, so the coder and others as humans
can understand and use it on that platform.
- Each platform has different interpretation and rules for code, and it is key to understanding code to
understand the rules that the code platform established to enable code to be written for that
platform.
- Code on its own has no meaning outside the coding rules set by the platform. So the technical
specification of the coding language itself, as specified by the platform, is also key to code
interpretation. And this brings another entity into the legal picture – the platform owners or
creators, who specify the rules for code on their platform.

Separately, any rules of conduct and process on the platform will be key to understanding the smart
contract itself – but these are not mentioned in the consultation, which is an omission that requires
correction.

5.99 - A functioning computer will generally always perform in accordance with its instructions: it
will “simply do what it is programmed to do”.
This is naïve and incorrect. See comments above to 3.34.

Question 43 - 6.5 - Are you aware of any business to consumer smart contracts currently in use or
in development? Please give details.
Our escrow service (smart payment or conditional payment) is used equally by B2B, B2C and C2C. So
about a third of our business is business to consumer.

7.21: a computer program deployed on a distributed ledger makes an offer
This concept is repeated throughout the Call for evidence. And yet here the concept is nonsensical,
and requires rethinking.

A distributed ledger is what it says, a passive ledger – a written record. Also known as a database. It
is an information store only, and cannot run a computer programme.

Previously the call for evidence referred to a computer program being recorded in a distributed
ledger. This terminology was correct. It is possible to store the code of a computer programme
within a distributed ledger. This makes sense.
But to speak of the computer program performing an action on a distributed ledger is fundamentally
incorrect, and misunderstands what a distributed ledger is.

A platform can be built around a data store held on a distributed ledger (or equally and equivalently
built around a replicated database – it makes no difference which).
The platform can then perform actions, such as running computer code stored within that
distributed ledger (or within that replicated database).
But it is then the platform performing the action (such as making an offer). It is not the distributed
ledger, and it is not really the computer programme, performing the action – it is the platform
performing the action which the programme which was stored requested.
And the platform itself will have its own legal identity and processing and platform rules, and these
fundamentally affect the legal position. Pretending that the distributed ledger performs the action is
plain wrong. And pretending that the computer code stored performs the action is also incorrect and
a fundamental misunderstanding.

We are happy to discuss any of the above points further, and if you require any elucidation or
clarification, please be in touch.

Best Regards,
Chapter 2: What is a smart contract?

Question 1

Please share your views below:

There is the potential for many types of contractual obligations to be possibly automated by using programs. One example may be the reconciliation and settlement of payments (or other value exchange) between transacting parties. The use of computer programs in this area could potentially speed up processes, lower transaction costs and reduce/avoid duplication of effort. Another example, may be the automation of processes which connect systems with offchain data sources (oracles). An example of this may be an insurance policy which may make the processing of claims more efficient and smoother. Another example, may be the automation of pricing (or the application of price changes) to purchasing volumes or new periods in time.

Question 2

Please share your views below:

We would suggest that where possible the study should be technology neutral, so that as the technologies evolve, the principles of the study could still be of use in relation to smart legal contracts which use them. Examples of this may be: (i) evolving DAG (directed acrylic graph) technology, or (ii) ‘smart contracting’ systems which use computer code to establish legal contracts but which do not necessarily require the use of DLT.

Question 3

Please share your views below:

This will depend on the specific use case, the specific requirements of the project, and the characteristics of the particular system on offer. Not all permissioned DLT systems are the same and neither are all permissionless DLT systems the same. Considerations, such as, scalability, security, privacy and whether the use case requires a private enterprise set-up (which may require a permissioned DLT system), or a publicly accessible network (which may require a permissionless DLT system) may be relevant.

Question 4
Natural language contract with automated performance

Please provide examples of how these forms of smart contract have been used in practice:

We would currently expect that natural language contracts with automated performance are more commonly being developed at the moment, than hybrid contracts or solely code contracts. However in the future there may be a shift more into hybrid, or code contracts.

Question 5

Please share your views below:

Question 6

Please share your views below:

The answer to this will depend on the specific use case and type of contract. Whichever process is followed, it will be important that there is clarity between the parties on the contractual rights and obligations that the parties have agreed to with each other, whether those are reflected in natural language or converted into code in order to reflect natural language subsequently.

Where computer coders are being relied on to convert natural language into contract code, it may be most efficient, for them to create a template which can be re-used or customised for multiple applications.

Question 7

Please share your views below:

Question 8

Please share your views below:

Smart contracts may (depending on the use case) potentially provide the following benefits over traditional language contracts:

- Speed of performance of a contract
- Reduction or avoidance of duplicated processes and effort
- Automation of routine tasks (eg ordering or notifications)
- Reduction of some disputes
- Enablement of some transactions between machines without requiring human intervention

However the costs of developing, programming and implementing the smart contract effectively from the outset would need to be factored in.

Chapter 3: Formation of smart contracts

Question 9

Please share your views below:

Question 10

Please share your views below:

Question 11

Please share your views below:

Question 12

Please share your views below:

Question 13

Please share your views below:

Question 14

Please share your views below:

Question 15

Please share your views below:

Question 16
Please share your views below:

Question 17

Please share your views below:

Question 18

Please share your views below:

Question 19

Please share your views below:

Question 20

Please share your views below:

Question 21

Please share your views below:

Question 22

Please share your views below: